The impact of engaging in verbal versus imagery-based worry on attenuational processing

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Abstract

Generalised anxiety disorder is characterised by excessive, uncontrollable, worry. The current study tested the idea that the verbal nature of worry in GAD, due to its abstract nature, might self-maintain by generating a widespread attentional bias for threat. It was hypothesised that verbal worry would generate more of an attentional bias for threat than imagery-based worry which, due to its more concrete nature, was hypothesised to produce attentional bias only for stimuli specifically relating to worry content. Verbal worry was also hypothesised to give rise to more negative intrusions than imagery-based worry.

In part one of the study, high-worriers were instructed to worry in either a verbal way (the Verbal group) or an imagery-based way (the Imagery group), before completing the dot probe task as a measure of attentional bias for threat-related words. In part two, the two groups worried in the same way as before and then completed the breathing focus task as a measure of the number of negative intrusions occurring after worry.

The results provided support for the hypothesis that verbal worry produces more attentional bias to threat than imagery-based worry but did not support the hypothesis that imagery-based worry would produce attentional bias to stimuli specifically relating to worry content. The two groups were not found to differ in number of negative intrusions following worry. The results are interpreted in terms of verbal worry generating a "general threat detection mechanism", and a new theory of GAD is presented that incorporates this speculated mechanism. Clinical implications of the current study's findings are discussed and consideration is also given to possible future avenues for research.

Chapter One

Introduction

1.1 Overview of Chapter

This chapter begins with an introduction to the literature regarding worry and its characteristics, before exploring three influential theories of worry. The third theory - the cognitive avoidance hypothesis – has heavily influenced the current study. This theory posits firstly that the function of verbal worry is the avoidance of anxiety-provoking mental imagery and secondly that this avoidance might negatively reinforce the worry process, allowing it to persist. Evidence for these assertions is summarised, before the properties of verbal processing and mental imagery are discussed in terms of how they might impact on worry. A new hypothesis is advanced, which proposes that verbal and imagery-based worry might engender different sorts of attentional bias. The dot probe methodology used in this research to assess attentional bias is summarised, followed by what has been learned to date regarding attentional bias for emotional stimuli. Attentional bias in normal, anxious and depressed samples is first considered, and finally what is known about the effects of worry on attention. The aims of the current study are then laid out, along with a summary of the study's design and the hypotheses to be tested.

1.2 Generalised Anxiety Disorder

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000), generalised anxiety disorder (GAD) is characterised by an excess of anxiety and worry which is perceived as difficult to control and is associated with cognitive (e.g., difficulty concentrating) and physiological (e.g.,

sleep disturbance) symptoms. While the focus of worry must not be purely restricted to the concerns inherent in other Axis I disorders in order to meet criteria for diagnosis, comorbidity of GAD with other disorders is common; Wittchen, Zhao, Kessler and Eaton (1994) found 90.4% of people with lifetime GAD to meet diagnostic criteria for at least one other lifetime disorder. Comorbidity of GAD with depression appears to be especially common (Kessler, Gruber, Hettema, Hwang & Sampson, 2008). The lifetime prevalence of GAD in Europe is estimated at 4.3-5.9% (Tyrer & Baldwin, 2006).

The primary feature of GAD is worry, to the extent that Andrews et al. (2010) proposed that the forthcoming DSM-V re-label it as "generalized worry disorder".

1.3 Phenomenology of Worry

Borkovec, Robinson, Pruzinsky and DePree (1983) defined worry as "...a chain of thoughts and images, negatively affect-laden and relatively uncontrollable" (p. 10). Many of these thoughts are "what if" type questions that are generated in the absence of threatening stimuli (Dugas, Gagnon, Ladouceur & Freeston, 1998), which are likely to bring to mind a multitude of possible negative outcomes. Borkovec et al. proposed that the subjective purpose of worry is to problem-solve issues linked with one or more negative and uncertain outcomes.

As for the affective experience of worry, Andrews and Borkovec (1988) experimentally induced worry in an unselected college sample and demonstrated a worry episode to comprise moderate amounts of anxiety as well as moderate amounts of depression, with no unique affective experience not already experienced in anxious and depressive states.

1.4 Uncontrollability of Worry

In the study of Borkovec et al. (1983), self-labelled worriers reported significantly more uncontrollability of the worry process once it had begun than non-worriers. These authors also took an objective measure of this uncontrollability in the form of a task in which participants focused on their breathing immediately following a period of worry (henceforth referred to as "breathing focus task"). The two groups were compared on the number of intrusions experienced during this task, in which their attention moved on to other topics and it was found that worriers were more distractible and had more negative intrusions than non-worriers. Ruscio and Borkovec (2004) used the same methodology to compare participants with GAD and worriers without GAD: They found people with GAD to show less control over negative intrusive thoughts on the breathing focus task immediately after worrying than worriers without GAD. The former also perceived their worry to be less controllable than the latter and, in addition, endorsed more beliefs about the disastrous consequences of not keeping worry under control.

Therefore, the research indicates that people with GAD perceive their worry to be less controllable and endorse more negative beliefs about the uncontrollability of worry than people without GAD. The research also shows that worries of people with GAD are objectively less controllable than those of people without GAD. These findings could be explained by one of two hypotheses:

1. Negative beliefs about worry lead to more objectively uncontrollable worry; and

2. Due to the objectively uncontrollable nature of worry in GAD, negative beliefs develop.

Three different models of worry in GAD will now be considered, the first of which focuses on the primacy of negative beliefs about uncontrollability of worry in GAD (hypothesis one), whereas the other two posit that people with GAD experience objectively uncontrollable worry aside from such negative beliefs, which might develop secondary to an experience of uncontrollability of worry (hypothesis two). The first model to be considered is the meta-cognitive model of Wells (1995).

1.4.1 Meta-cognitive model.

According to Wells (1995), worry is driven by meta-beliefs, i.e., beliefs about the worry process. Type I worry involves positive beliefs, for instance, regarding the usefulness of worry in aiding problem solving, and therefore motivates the individual to worry in certain situations, such as when problems arise. What is hypothesised to set people with GAD apart from non-clinical worriers is Type II worry, comprising negative beliefs about worry, e.g., that it is uncontrollable. These negative beliefs then lead on to unhelpful strategies for reducing worry, such as avoidance or thought suppression, which actually serve to increase the intrusiveness of worry, i.e., increase its uncontrollability. Now the intolerance of uncertainty model of GAD will be considered (Dugas et al., 1998), which provides an account of how worry in GAD might entail some inherent, objective uncontrollability (hypothesis two).

1.4.2 Intolerance of uncertainty.

According to Borkovec et al.'s (1983) definition of worry, events with uncertain outcomes are the focus of the worry process. Dugas et al. (1998) outlined a model of GAD which places intolerance of uncertainty at centre stage in the disorder, which is defined by

Dugas, Buhr and Ladouceur (2004) as an individual's predisposition to reacting in a negative way (cognitively, emotionally and behaviourally) to uncertain situations. According to the model of Dugas et al. (1998), people who have a higher intolerance of uncertainty react to uncertain situations by asking "what if?" questions, which leads them to consider many possible negative outcomes, leading on to worry and anxiety. The basic assumptions of this model have been empirically supported. For instance, Ladouceur, Gosselin and Dugas (2000) induced varying levels of intolerance of uncertainty using a gambling procedure, and found evidence for a higher level of worry in those in whom intolerance of uncertainty was experimentally elevated than those in whom it was reduced. According to this model, objective uncontrollability of worry in GAD might arise from the short-term effectiveness of the worry process in dealing with intolerance of uncertainty and its associated anxiety in the short term, making it a highly reinforced behaviour which might become increasingly automatic over time. Now we shall consider the model of GAD that has most influenced the current study, which provides another account of how worry might entail some objective uncontrollability (hypothesis two).

1.5 Cognitive Avoidance Hypothesis

Similarly to the model of Dugas et al. (1998), the cognitive avoidance hypothesis (Borkovec, Alcaine & Behar, 2004) can provide an account for how worry might be objectively uncontrollable in GAD due to its short-term anxiety-reducing properties. This model was devised to account for the relative dominance of verbal processing in the phenomenology of worry (Borkovec & Inz, 1990), which cannot be easily explained by either the model of Wells (1995) or Dugas et al. (1998). Borkovec and Inz found non-anxious controls to report predominantly mental images when relaxed, which shifted to

including mostly thought when worrying, which the authors described as "abstract, conceptual thinking activity" (p. 153). People with GAD, on the other hand, reported a balance of imagery and thought when relaxed, with a non-significant increase in thought content and decrease in imagery content during worry. East and Watts (1994) found a significant increase in thoughts and a decrease in images among high trait worriers moving from relaxation to worry. When images do occur in the worry process, they tend to be fleeting and are quickly replaced by verbal thought activity (Sibrava & Borkovec, 2006).

Based on these findings, the cognitive avoidance hypothesis (Borkovec et al., 2004) holds as its central premise that the verbal worry process serves not only as a perceived problem-solving tool for avoiding or mitigating the aversive scenario itself but also as a means of avoiding the somatic symptoms of anxiety elicited by mental imagery associated with this feared scenario. Borkovec (1994) evoked Mowrer's (1947) two-factor learning theory in which anxiety-provoking imagery is comparable to a phobic stimulus that is avoided by engaging in worry because worry dampens somatic anxiety in the short-term. This anxiety-dampening effect of worry will be negatively reinforced, rendering it an increasingly automatic strategy, accounting for how worry might become objectively uncontrollable in GAD. Borkovec also drew on the theory of Foa and Kozak (1986) to propose that, in the longer-term, the avoidance of mental imagery will prevent full habituation from occurring, which requires repeated exposure to aversive stimuli and the activation of entire "fear structures" stored in memory, which includes imagery as well as affective components. If verbal worry precludes the prolonged and full activation of imagery as well as affective processing, it would preclude habituation and maintain anxiety to the stimulus in question. Borkovec also noted that, while worrying might help the individual to avoid imagery, it might also prime images such that they are more easily

retrieved. This provides an additional route to worry being objectively uncontrollable, as images that are primed could come to mind in a way that is intrusive, triggering another highly reinforced worry episode.

There is empirical support for the conceptualisation of worry as avoidance of anxiety-provoking imagery. Borkovec and Hu (1990) demonstrated that worrying before looking at phobic images relating to giving a speech lowered cardiovascular response to the images, relative to being in a neutral state preceding image presentation. Worry can also function to suppress affect after the presentation of aversive stimuli: Butler, Wells and Dewick (1995) found that instructing participants to worry about an anxiety-provoking video in a verbal way after viewing it led to a greater decrement in anxiety than those who generated mental images from the video. As support for the idea that verbal worry maintains itself, these authors also found that participants instructed to worry in a verbal way reported more frequent intrusions relating to the video they had seen in the days that followed, compared with those who generated images about the video. In a similar vein, a recent study by Stokes and Hirsch (2010) found that engaging in negative verbal processing of real-life worry topics (i.e., typical verbal worry) in high worriers increased the number of negative intrusions on a breathing focus task, in keeping with studies discussed previously, whereas engaging in negative imagery-based processing of real-life worry topics decreased the number of negative intrusions. Now let us consider the properties of verbal processing that might make it unhelpful in the maintenance of worry.

1.6 What Is Unhelpful about Verbal Processing?

The cognitive avoidance hypothesis asserts that it is the inherently abstract nature of verbal worry that is important. By being more abstract, it elicits a lesser somatic anxiety

response than imagery, which is a more concrete representation of the feared scenario. An experiment by Vrana, Cuthbert and Lang (1986) supports this assertion, which showed that verbal articulation of fear material elicits little cardiovascular response, whereas more concrete imagination of a scene that represents the same fear evokes considerable cardiovascular response.

Stöber's (1998) reduced-concreteness theory of worry proposes that it is the fact that verbal worry is not a concrete process that leads it to reduce the amount of imagery. Stöber, (1997) found worry in a nonclinical sample to become less concrete as participants worried more about the problem in question. The reduced-concreteness theory draws on dual coding theory (Paivio, 1971, 1986), in which the quality of imagery is determined in part by the concreteness of words and sentences, due to the integrated nature of verbal and imagery-based processes. For instance, Paivio and Marschark (1991) showed abstract sentences to generate images that were less vivid than concrete sentences, and the images were also generated more slowly and with less ease. Now let us consider what might be the utility of imagery-based processing.

1.7 What Is the Utility of Imagery-Based Processing?

Kosslyn, Behrmann and Jeannerod (1995) considered imagery to be "'seeing' in the absence of the appropriate immediate sensory input" and provided evidence for this by demonstrating primary visual cortical activation to be implicated in both visual perception and visual imagery; furthermore, the bigger the size of the imagined object, the greater the activation of the primary visual cortex.

The overlap between visual perception and mental imagery forms an important basis of Holmes and Mathews' (2010) model of the impact of verbal/imagery representations on emotions. According to this model, mental imagery can arise via a bottom-up route in which sensory cues that match representations in episodic and semantic memory can cause those memories to be automatically and involuntarily retrieved as images. Mental imagery can also result from a top-down process in which images are volitionally constructed. As imagery involves the activation of brain systems involved in processing perceived events, it directly accesses emotional systems. The degree of emotional activation depends on the type of image, and a field perspective (as though looking at the imagined scene through one's own eyes) elicits more emotion than an observer perspective (as though seeing the scene from the position of a third person), as indicated in the research (e.g., Holmes, Coughtrey & Connor, 2008). According to the model of Holmes and Mathews, as verbal processing involves less overlap with perceived events, when it is retrieved from autobiographical and semantic memory stores (either via a top-down or a bottom-up process) it does not elicit as much emotion.

When participants are trained to deliberately imagine their worries, as in the current study, it could be said that the top-down route is activated, allowing for imaginal exposure (Foa, Steketee, Turner & Fischer, 1980) to "fear structures" (Foa & Kozak, 1986) and a consequent reduction in associated anxiety; according to the cognitive avoidance hypothesis (Borkovec et al., 2004) this would lead to a reduction of worry. Holmes and Mathews (2010) speculated on some additional ways in which generating mental imagery might be beneficial. For one, exposure to imagery might help impress on the individual the realisation that images are merely representations of the world and not the world itself. Holmes and Mathews also discussed the possibility of rescripting (e.g., Butler & Holmes,

2009) in which participants are instructed to transform their negative image into something more neutral, which might have a positive emotional impact.

1.8 Summary of the Cognitive Avoidance Hypothesis

The cognitive avoidance hypothesis asserts that a key function of verbal worry in the short-term is to suppress anxiety-provoking mental imagery. The effectiveness of this strategy might partly account for the objective uncontrollability of worry in GAD, as verbal worry will become highly negatively reinforced and, as a result, a relatively automatic strategy for reducing anxiety. However, in the longer-term, such avoidance of anxiety-provoking mental imagery will interfere with the habituation of the mental imagery that is being suppressed and its associated affect, which will serve to increase the individual's reliance on the verbal worry process in suppressing imagery.

Evidence supporting the premises of the cognitive avoidance hypothesis has been discussed. The unhelpful non-concrete nature of verbal worry has been discussed, as well as some reasons why imagery-based processing might be helpful in reducing worry.

The current study is concerned with a complementary hypothesis as to how verbal processing might perpetuate the worry process. As mentioned previously, Stokes and Hirsch (2010) found verbal worry to give rise to a higher number of negative thought intrusions on the breathing focus task than imagery-based worry. One interpretation for this is that verbal worry, once initiated as a means of avoiding mental imagery, might generate an attentional bias for negative stimuli, leading to more negative thought intrusions that interfere with the core task of focusing on one's breathing. The potential role that attention has to play in maintaining worry will now be considered in more detail.

1.9 The Role of Attention

According to the combined cognitive bias hypothesis of Hirsch, Clark and Mathews (2006), the presence of a bias in one cognitive process can generate a bias in the same direction in other cognitive processes. The study of Hertel, Mathews, Peterson and Kintner (2003) is supportive of this idea: Participants in whom an interpretation bias was generated (either toward threat-related or neutral stimuli) went on to generate mental images in a later task that were congruent with the trained interpretation bias (i.e., either threat-related or neutral in valence). This study indicated, therefore, that a bias in the cognitive process of interpretation can generate a similar bias in the process of generating mental imagery.

Hirsch and Mathews (submitted) have proposed a new cognitive theory of worry in GAD, which incorporates the notion of cognitive biases transferring from one cognitive process to another: The theory proposes that the abstract (non-specific) nature of verbal worry generates a non-specific attentional bias, which serves as a "general threat detection mechanism". For example, if a person with GAD worries about illness in verbal form, the abstract nature of this process would involve the generation of hypothetical scenarios characterised by "what if" questions (Dugas et al., 1998), in which the person might start off worrying about feeling ill but might also begin to worry about things that are vaguely related, such as the number of sick days they have left. This generation of multiple possible negative outcomes could lead to a catastrophising process in which they might worry about losing their job, their income, and their house. As a result, the worry process would encompass diverse themes. Verbal worry is also abstract as it is likely to include threat words that are vague and non-specific, such as "awful" and "disaster", which might also trigger a non-specific attentional bias for all sorts of threatening scenarios. If an attentional

bias for a wide range of potential threat operates, then this is hypothesised to lead to more negative thought intrusions (as found in Stokes & Hirsch, 2010), and perseveration of worry.

In the same example of a person with GAD worrying about illness, a more concrete processing style, such as imagery-based worry, might involve generating a detailed image of being at home in bed, with limited movement from one worry topic to another. This sort of concrete processing style is hypothesised to lead to a more specific attentional bias only for those stimuli that are related to the worry topic. If the theory of Hirsch and Mathews (submitted) were valid, we would expect attentional bias to be less widespread after worry in imagery-based form and there should also be fewer intrusions.

Attention is a particularly relevant candidate for us to consider in relation to worry due to the wealth of research that has linked anxiety and depression with attentional biases for emotional stimuli. We shall now consider the paradigm that is used in the current study to measure attentional bias for emotional stimuli.

1.10 The Dot Probe Task

Cisler, Bacon and Williams (2009) reviewed the literature on attentional biases for threat and concluded that "Attention towards threat has probably most extensively been studied using the dot probe paradigm." This task was developed by MacLeod, Mathews and Tata (1986) by adapting a cognitive psychological paradigm that analysed the characteristics of visual attention indirectly through the measurement of manual reaction times (henceforth: RTs) to visual stimuli (e.g., Posner, Snyder and Davidson, 1980; Navon and Margalit, 1983). The research using this paradigm had already indicated that

participants are faster to respond to visual stimuli when they appear in an attended location. MacLeod et al. presented participants with a number of trials each beginning with a pair of words presented on a computer screen, one on top of the other, for 500 ms before disappearing (this is known as the stimulus onset asynchrony, or "SOA" - the duration of cue presentation prior to the appearance of the probe stimulus). On only some trials, a pair was replaced by a dot in the position of one of the former words, whereas on most trials there was no dot ("filler" trials). A pair of words could either comprise two neutral words or one threat related and one neutral word (which comprised a "critical" trial when the Threat-Neutral word pairs were followed by a probe). Participants were instructed to press a button as quickly as possibly when they saw a probe (a black dot). On the dot probe task, an Attentional Bias Index is calculated for each participant by subtracting the mean RT to dots replacing threat stimuli from the mean RT to dots replacing neutral stimuli on a critical trial. A positive index score indicates a relatively faster RT to threat, i.e., an attentional bias for threat. MacLeod et al. found a positive index score in their group of participants with GAD, whereas this was not found in the control group. These results were taken to show that people with GAD show an attentional bias for threat-related stimuli and it was also reasoned that this likely reflects the anxious individual's tendency to favour the processing of threatening versus non-threatening information encountered in daily life.

Since the study of MacLeod et al. (1986), the dot probe task has been used in various forms. Salemink, van den Hout and Kindt (2007) have termed the original version the "detection" task. In this version, participants are required to press a button to indicate when they have detected a probe, as was the case in the study of MacLeod et al. Mogg and Bradley (1999) noted two major limitations to this early version of the dot probe task, the first being that it requires "filler" trials in which no probe appears, which places a higher

load on participants' sustained attention, and that this is likely to be impaired in emotionally disordered individuals. The second shortcoming that Mogg and Bradley discussed is that, as threatening words are more likely to appear on trials in which a probe appears, participants might use this covariation as a "warning cue" for the appearance of a probe and base their responses on this rather than waiting to see a probe appear. Mogg and Bradley therefore developed a new variant of the dot probe task to overcome these drawbacks, which they termed the "probe position" task. In this task, "filler" trials are not required as participants indicate on each trial, by pressing one of two buttons, where the probe appears (e.g., in the location of the top or the bottom word) as opposed to whether or not a probe appears. Nonetheless, these authors acknowledged a theoretical problem with this task, as participants could adopt a strategy of attending to only one location and base their response on whether or not the probe appears in that location. These authors proposed that the "probe classification" task of MacLeod and Chong (1998), in which participants' responses indicate the type of probe that is seen on every trial (whether a horizontal pair of dots [:] or a vertical pair [..]), rather than its location, overcomes the shortcomings of their "probe classification" task as well as those of the "detection" task.

Salemink et al. (2007) compared the "probe classification" task with the "probe detection" task in effectiveness at revealing a correlation between attentional bias and anxiety in a non-clinical sample. The "probe detection" task was found to be superior in this regard, detecting attentional bias where the "probe classification" task did not. Nonetheless, the authors acknowledged that dot probe tasks are known to be inconsistent and a fragile indication of anxiety-related attentional bias in non-clinical samples, as had also been concluded by Mogg et al. (2000). Hence, until this result is replicated, it should be interpreted with caution. Now we shall consider in more detail what the dot probe task,

as well as other attentional paradigms, have taught us with regard to attentional bias for emotional stimuli across normal, anxious and depressed samples.

1.11 Attentional Bias for Threat

1.11.1 Sample characteristics.

The original findings of MacLeod et al. (1986) have been well replicated using the dot probe task, showing a significantly stronger bias for threatening words in clinical groups than in non-clinical controls (e.g., GAD: Mogg, Mathews & Eysenck, 1992 and Mogg, Bradley & Williams, 1995; panic disorder and social anxiety: Hornstein & Segui, 1997; post-traumatic stress disorder: Bryant & Harvey, 1997). Attentional bias for threat has also been found to operate in depression (Bradley et al., 1997).

Schmukle (2005) noted that attentional bias has been found less consistently in non-clinical "high trait anxiety" than in clinical anxiety. For instance, Schmukle noted that, although the study of Broadbent and Broadbent (1988) found a relationship between anxiety and attentional bias in which only high trait anxious individuals showed attentional bias for threat, this was not replicated in two subsequent studies (Mogg, Bradley, de Bono and Painter, 1997; Mogg et al., 2000). Schmukle accounted for this inconsistency by conducting a study which showed the dot probe task to have low internal consistency and test-retest reliability in an unselected sample and argued that this meant the dot probe is not appropriate for investigating inter-individual differences within a given sample, e.g., a non-clinical group. However, Schmukle noted that these results do not apply to studies that compare the effects of different experimental treatments, as is the case in the current study.

There is some evidence that attentional bias can differ according to the type of anxiety. Social anxiety is one type that has been shown to engender a bias in attention away from emotional facial stimuli (e.g., Mansell, Clark, Ehlers & Chen, 1999). In some cases, this attentional avoidance of faces has been demonstrated regardless of the valence of the face (e.g., Chen, Ehlers, Clark & Mansell, 2002). However, this is not a consistent finding as there are many studies which have found no such effect in social anxiety, whether using faces (e.g., Sposari and Rapee, 2007) or words (e.g., Mansell, Ehlers, Clark & Chen, 2002).

1.11.2 Stimulus characteristics.

The types of stimuli that can elicit attentional bias have contributed to our understanding of the phenomenon. Bradley, Mogg, Falla and Hamilton (1998) found high trait anxious participants to show an attentional bias for threatening faces and away from happy faces. In a similar vein, some researchers have opted to use more biologically relevant stimuli (see Seligman's [1971] theory of "preparedness" in anxiety). For instance, Yiend (2010) concluded from the research that the use of biological stimuli in the dot probe task (such as pictures of snakes or spiders) is one condition under which attentional biases are found in the general population.

Bradley et al. (1997) argued that pictorial stimuli are more naturalistic than the single word stimuli traditionally used in attentional bias research. Furthermore, they noted that familiarity and frequency effects might confound research findings, in which, for instance, the frequency with which anxious participants use certain words might prime these words in such participants, leading to biased RTs as a result of this rather than the effects of attentional bias for threat. On the other hand, Mogg and Bradley (1999) made the case for the use of word stimuli in some cases, in that words "can reflect a wide range of

anxiety-related cues which enhances their usefulness in studies of the content-specificity of processing biases in different anxiety disorders, such as panic disorder and generalised anxiety disorder."

Some studies have categorised pictorial stimuli at different levels of threat value to test the effects of stimulus intensity on attentional bias for threat. For instance, Koster, Crombez, Verschuere and DeHouwer (2004) showed high- and low-trait anxious participants pictures of varying threat intensities and found both groups to have an attentional bias for highly threatening pictures, whereas the high trait anxious group demonstrated a stronger attentional bias for moderately threatening pictures than the low-trait anxious group. This is consistent with the "cognitive motivational" theory of Mogg and Bradley (1998), in which higher anxiety engenders higher reactivity to threat such that the same stimulus will be reacted to as if of a higher threat value in more highly anxious individuals than in less anxious individuals.

Another determinant of reactivity to threat stimuli is the degree of relevance of threatening stimuli to the individual's concerns. Mogg et al. (1992) employed the dot probe task to investigate the specificity of attentional bias for stimuli related to participants' predominant domains of concern (henceforth referred to as "domain-specific" attentional bias). The authors asked participants whether they were more frequently concerned about social worries or physical worries, as well as the degree to which they were concerned about each type of domain. A significant correlation was found between attentional bias for social threat words and participants' degree of concern about social threat, but not with degree of concern about physical threat. A non-significant positive correlation was found between attentional bias for physical threat words and participants' degree of concern about

physical threat, but not with degree of concern about social threat. The findings of this study were in contrast to those of MacLeod et al.'s (1986) seminal study, in which no evidence was found of specific attentional bias for social or physical threat words aligning with participants' domains of concern on the dot probe task. Mogg et al. argued that the study of MacLeod et al. did not categorise participants into domains of predominant concern in a way that would be sufficiently sensitive to the specificity of attentional bias, as participants were merely categorised as being predominantly concerned by either physical or social threats by use of a single forced-choice question, with no quantitative ratings of the degree to which they worried about both domains.

Domain-specific attentional bias has been demonstrated more consistently in studies that have used the modified Stroop colour-naming task, in which participants are presented with lists of words of the same category on the same sheet and go through each word sequentially, reporting the colour in which each word is printed as quickly as possible rather than reading aloud the word itself (e.g., Mathews & MacLeod, 1985; Mogg, Mathews & Weinman, 1989; McNally et al., 1994; Mattia, Heimberg & Hope, 1993). An interference effect was found in these studies, in which participants were significantly slower to read aloud the colours of words relating to their specific concerns than words not relating to their specific concerns, which is traditionally interpreted as due to the effect of biased attention toward the word contents competing with attentional resources required to name the colour in which the words are printed. Mogg et al. suggested this could be due to anxiety involving an initial general bias for all sorts of threatening stimuli at an early stage of processing, which is not available to conscious awareness, followed by an elaboration of the domain-relevant stimuli at a later stage of processing, which enters conscious awareness. The authors argued that this later, elaborative process is more likely to occur on

the modified Stroop task as stimuli are repeatedly presented in a block all together, remaining available for longer; on the dot probe task stimuli are presented much more briefly and might not reach this later stage in the information-processing sequence. When Mogg, Brendan, Bradley, Williams, Mathews (1993) conducted the original Stroop task in which stimuli were presented sequentially but in isolation, there was no such domain-specific interference effect. Following this result, the authors additionally proposed that the blocked nature of words of a similar semantic content on the modified Stroop task might allow for the requisite elaborate processing of a theme, which might allow domain-specific attentional bias to emerge.

Another stimulus characteristic that has been modified in the dot probe task is the SOA. Since the study of MacLeod et al. (1986), the dot probe task has included SOAs longer and shorter than 500 ms in order to explore the operation of attentional biases at different stages of processing. In her review of the literature on attentional bias for emotional stimuli, Yiend (2010) noted that "normal" samples seem to show attentional bias for threat only at certain SOAs on the dot probe task but that this is not the case in highly anxious samples. For example, Cooper and Langton (2006) tested an unselected student sample on a modified dot probe task and demonstrated an attentional avoidance of happy faces with no significant bias for angry faces at an SOA of 100 ms; however, at 500 ms, this pattern had more or less reversed, with significant avoidance of angry faces and a trend toward attentional bias for happy faces. Conversely, attentional bias for threat in highly anxious samples has been shown to occur at SOAs ranging from 14 ms (Bradley, Mogg & Lee, 1997 – cues presented at this SOA were also masked) to 1500ms (e.g., Bradley et al., 1998). On the other hand, attentional bias in depression is only found when more time is given for stimulus processing, e.g., Bradley et al. (1997), who found an attentional bias for

negative words during induced/natural sad mood at SOAs of 500 and 1000 ms, which disappeared at shorter SOAs and when stimuli were masked. These findings have implications for the stages of processing at which attentional bias can operate, which will now be discussed.

1.12 Automatic and Strategic Processing

Moors and De Houwer (2006) summarised the concept of automatic processing in cognitive psychology as involving processing that is "unintentional, uncontrolled/uncontrollable, goal independent, autonomous, purely stimulus driven, unconscious, efficient, and fast". Strategic processing could be taken to mean essentially the opposite, bearing in mind that research indicates automatic and strategic processing to merely represent two extremes of a continuum (e.g., Posner & Snyder, 1975). Yiend (2010) noted that these different aspects of automaticity are not always present together and that "awareness" is the characteristic that has been most frequently investigated, which can be varied by presenting stimuli either subliminally (e.g., at stimulus durations < 14 ms and/or masked) or supraliminally (at longer durations without masking). Yiend also noted that automaticity is related to the "preattentive" processing stage in Treisman and Gelade's (1980) feature integration theory, in which basic perceptual properties of visual stimuli, such as colour, are processed in parallel. Following the "preattentive" stage, a serial process takes place in which attention binds these individual properties together such that stimuli are perceived in their combined features.

The two-stage theory of Williams, Watts, MacLeod and Mathews (1988, 1997) gives a detailed cognitive account of the different attentional bias in anxiety and depression. This theory proposes a time-course of attention, in which priming occurs first along the

chronology of processing, and elaboration happens later. These two processes can be said to relate to the automatic/preattentive and strategic continuum. According to this theory, two crucial mechanisms operate at both priming and elaborative stages: An affective decision mechanism (ADM) and a resource allocation mechanism (RAM). The stimulus input is processed by the ADM in the priming/preattentive stage, increasing its output at this point in proportion to its threat value (the individual's state anxiety also increases output at the ADM). Once a particular threshold of activity is reached, the ADM's output goes to the RAM of the priming/preattentive stage, where an individual with high trait anxiety will direct their attention towards threat at this stage, whereas low trait anxious individuals will attentionally avoid the stimulus. The output from the priming/preattentive stage is passed on to the elaborative stage, in which the same sequence of events occurs, except that state depression increases output at the elaborative ADM, and trait depression determines whether the stimulus is given greater or reduced elaborative processing at the elaborative RAM.

Mogg et al. (1993) noted that the theory of Williams et al. (1998, 1997) does not explain the observation in their study that attentional bias for threat is absent in depressed samples who also have high anxiety. The Mathews and Mackintosh model (1998) might provide a better account for this observation. In their model, attention to threat cues in anxiety depends on the interaction of two opposing tendencies: Bottom-up activation of threat representation by a threat evaluation system (TES – similar to the ADM of the two-stage theory of Williams et al.) and top-down activation of competing representations related to non-threat-related goals by effortful task demand (ETD). Representations of threatening stimuli in the TES are stimulated by sensation of the stimuli themselves, and the TES in turn sends back activation to threatening representations, increasing attention to

them. The TES will only send activation to threatening representations when it's sufficiently activated, and its activation increases with increasing state anxiety and subjective severity of the threat stimulus (proposed to be higher in high trait anxious individuals). Any attentional biases result from an interaction between the TES and ETD and, as the ETD is a limited-capacity system and the TES is not, a point is always reached at which the TES will prevail and attention will shift to the threatening/distracter stimulus. Depression could be argued to entail top-down inhibition of threat representations, leading to the overriding of anxiety-linked attentional bias when there is comorbid depression.

The cognitive motivational view of Mogg and Bradley (1998) mentioned previously argues that the different results regarding attentional bias in anxiety and depression can be explained in terms of the reference axes of “valence” and “engagement”; whereas anxiety involves negative affect and external goal engagement, depression involves negative affect and disengagement from external goals. According to this model, comorbid depression impairs the external goal engagement in anxiety with its disengagement mechanism, giving rise to no preattentive bias for threat when there is comorbid anxiety and depression. However, the Mathews and Mackintosh (1998) and Mogg and Bradley models do not explain the fact that depression does show an attentional bias at stimulus presentations of longer than 500ms (Bradley et al., 1997), whereas the previously discussed model of Williams et al. (1988, 1997) does provide an account for this.

The “vigilance avoidance hypothesis” (Mogg, Bradley, Miles & Dixon, 2004) is a subsidiary element of the Mogg and Bradley (1998) model, which posits that there will always be an automatic attentional bias away from threat at lower levels of threat intensity but that this gives way to an automatic attentional bias for threat as the intensity of threat

increases. Those high in trait anxiety have a lower threshold of objective threat level required to trigger automatic attentional bias for threat. Furthermore, the automatic attentional bias for threat is followed by a strategic attentional avoidance of threat at longer SOAs, in order to reduce anxiety. Mogg et al. provided evidence in support for this by showing high trait anxious individuals to show an attentional bias for threat at an SOA of 500 ms but no attentional bias for threat at 1500 ms, on the dot probe task. In those high trait anxious participants with a fear of blood-injury, there was significant avoidance that set in at the longer SOA. Mogg and Bradley (2006) found a significant attentional bias for spider stimuli on the dot probe task only at a shorter SOA (200 ms) and not at longer SOAs (500 and 2000 ms), in a spider-phobic sample.

Cisler and Koster (2010) made an important qualification to be borne in mind when discussing automatic and strategic processing: That the boundary between the two is not well defined. These authors cited Pessoa (2008), who had argued against keeping apart the emotional and cognitive systems of the brain (these could be said to map on to automatic and strategic processes, respectively), as these systems are interactive. For instance, Pessoa (2005) demonstrated that automatic amygdala activation toward threat depends on availability of strategic attentional resources, a strategic process. Now that we have considered stimulus and participant characteristics under which attentional bias takes place, as well as the stages of processing at which attentional bias is apparent, let us look at the different components of attention that research has unveiled and the roles they play in attentional bias for emotional stimuli.

1.13 The Components of Attention

Posner (1980) pioneered an experimental paradigm in which the separate components of visual attention could be explored. Participants sat in front of a computer monitor and fixated a central stimulus while a simple peripheral cue appeared either to the left or to the right of fixation. After a very brief period the cue would disappear and a stimulus appeared either at the same location (known as a valid trial) or at the opposite location (known as an invalid trial) as the preceding cue, to which the participant responded. Participants maintained their focus on the fixation cross throughout the experiment and were instructed not to move their attention to cues or the stimuli that followed them.

Posner, Inhoff, Friedrich and Cohen (1987) hypothesised the operation of three component subroutines to the visual attentional process: "Engage" to a location, "disengage" from that location and "move" to another location. These components and their independent neural bases were empirically supported by neuropsychological research; for example, Posner, Walker, Friedrich and Rafal (1984) demonstrated that damage to the parietal lobe uniquely impairs RTs on invalid trials, which was taken to indicate that this brain region mediates the operation in which people disengage their attention from an attended stimulus.

In order to explore components of attention as they might relate to emotional material, Yiend and Mathews (2001) modified the original Posner task such that the cue on each trial was either a neutral or a threatening picture, and used a selected population consisting of participants with high trait anxiety and those with low trait anxiety. These authors found that attentional bias for emotionally threatening pictures in high trait anxious

individuals impairs the disengage component of the attentional sequence and that the engage component is not affected.

Fox, Russo, Bowles and Dutton (2001) noted a limitation to all prior versions of the dot probe in that results from the dot probe task could only detect that an attentional bias was operating but that the data could not identify the components of attention that were affected. The "Attentional Bias Index" discussed previously in relation to the dot probe task can indicate whether there is an attentional bias for threat but it can only tell us whether there is a speeding of RTs on trials when a probe replaces a threatening stimulus relative to trials when a probe replaces a neutral stimulus; it does not tell us whether this is due to faster responses to dots replacing threat stimuli (reflecting the engage function) or slower responses to dots replacing neutral stimuli (reflecting the disengage function).

More recently, the dot probe task has been modified to allow for a more fine-tuned analysis of the components of attention that are affected by anxiety. Koster et al. (2004) adapted the dot probe task to allow for a decomposition of engage and disengage components of attention. This was achieved by adding Neutral-Neutral trials that are always probed, just like Threat-Neutral trials, i.e., trials in which there is not a threat word but both words are neutral in valence. This provided a baseline measure of RTs to visual stimuli. By comparing the baseline RTs to probes replacing threat words on Threat-Neutral trials or probes replacing neutral words on Threat-Neutral trials, the dot probe allowed for the engage and disengage components of attention to be investigated. Salemink et al. (2007) first used the adaptation of Koster et al. in order to assess the engage and disengage components of attention in different anxiety groups and, similarly to Yiend and Mathews

(2001), found high trait anxiety to delay disengagement from threat-related words but not to enhance attentional engagement to these words.

1.14 Attentional Bias in Worry

Very little is known as yet about attentional bias relating specifically to worry. Only one study (Oathes, Squillante, Ray & Nitschke, 2010) has used the dot probe to look at attentional bias in worry to date, in which a group of low worriers performed the dot probe task after two separate conditions: One in which they worried and the other in which they performed a distractor task. The authors found no significant Condition x Threat Position x Probe Position interaction on an ANOVA, indicating the absence of an attentional bias for threat following worry. An additional analysis by Oathes et al. showed worry to speed RTs to the attended location (as participants in their version of the dot probe task were instructed to read the top word aloud) more so on Threat-Neutral trials than Neutral-Neutral trials, as indicated by a Condition x Trial Type x Probe Position interaction, which was interpreted in favour of worry generating more "vigilance" in the presence of threat. Another recent study by Hirsch et al. (2011) looked at the effects of training attentional bias for threat meanings on worry in a normal sample. They found that training participants to engage their attention to threat meanings gave rise to more negative intrusions on the breathing focus task than training that achieved the opposite, whereas training that impaired disengagement from threat meanings did not give rise to more negative intrusions on the breathing focus task than training that achieved the opposite.

1.15 The Current Study: The Impact of Engaging in Verbal versus Imagery-Based Worry on Attentional Processing

1.15.1 Two different methods of measuring attentional bias for threat.

The current study employs two different experimental tasks in order to investigate the effect of different forms of worry on attentional bias for threat, i.e., allocation of attentional resources toward threatening stimuli. The first is the dot probe task. If attentional bias for threat is operating, it will influence responding on the dot probe task, as probes replacing threatening words will receive quicker responses due to attention having been allocated to threatening stimuli. As stimuli are presented for 200 ms, any attentional bias for threat will be operating at a relatively automatic stage of processing.

A similar mechanism is proposed to produce more negative intrusions on the breathing focus task. Attentional bias for threat will direct attention away from the neutral stimulus of one's breath and toward negative stimuli, such as sensations of physical fatigue or cognitions that are negative in valence. Unlike the dot probe task, the breathing focus task is not proposed to represent any specific point of the automatic-strategic continuum of attentional bias. An additional mechanism that might bias responding on the breathing focus task is interpretation bias; for example, a negative interpretation bias might make one more likely to interpret the sensations of physical fatigue as negative (e.g., as being due to illness) rather than neutral (e.g., as resulting from hunger).

1.15.2 Aims.

The current study concerns itself with the effects of worrying on attentional bias. It was reasoned that abstract and non-specific verbal worry might engender a non-specific

attentional bias for threat by activating a general, non-specific threat system, and that this would manifest as facilitated engagement to a wide range of threat-related stimuli and/or as impaired disengagement from these stimuli, on the dot probe task. In contrast, it was reasoned that more concrete and specific imagery-based worry might engender a more specific attentional bias only to threat words on the dot probe task that are highly related to worry content. If an attentional bias for a wide range of potential threats were in operation, then we would also expect this to lead to more automatic negative thought intrusions on the breathing focus task.

As worry is known to be dimensional as opposed to categorical and continuously distributed among the population in terms of severity (e.g., Ruscio, Borkovec & Ruscio, 2001), Hayes and Hirsch (2007) noted that studies on people without GAD can be helpful for investigating worry.

1.15.3 Overview of design.

The present study recruited high worriers (scores > 55 on the Penn State Worry Questionnaire [PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990]) who were not required to meet criteria for GAD. Participants were randomly allocated to either a Verbal or an Imagery group and each participant was trained to worry in a verbal way or an imagery-based way, depending on group allocation. In the first part of the study, participants worried for a 6 minute period in their designated style before completing the dot probe task, with another 2 minute worry period placed in the middle of the dot probe task to re-activate worry. In the second half of the study, participants worried for another 6 minute period about a different worry of theirs, before completing the breathing focus task. Mood Rating

Scales measuring depression, anxiety and happiness were completed at various points during the study.

1.15.4 Hypotheses.

The study had the following hypotheses:

1. Inducing verbal worry leads to a stronger attentional bias for threat-related words on the dot probe task than inducing imagery-based worry.

2. There will be specificity effects in the Imagery group in which attentional bias will be more evident toward threat words relating specifically to what participants worry about, whereas this effect will not be present in the Verbal group.

3. In replication of Stokes and Hirsch (2010), inducing verbal worry will lead to a significantly higher frequency of negative intrusions in a breathing-focus task than inducing imagery-based worry.

Chapter 2

Methodology

2.1 Introduction

This section first describes the two pilot phases of the study, before detailing the recruitment procedure for the main experiment. The materials used in the study are then briefly summarised before the experimental procedure is described. Finally, ethical considerations of the study are listed along with a summary of how the study deals with these.

2.2 Pilots

There were two stages of piloting the experimental procedures to be used in the main experiment.

2.2.1 Pilot one.

Six participants were included in this pilot (six females; mean PSWQ score = 67). This pilot was conducted in order to determine the duration of word pair exposure on the dot probe tasks that would be most likely to demonstrate a significant effect. This pilot consisted of a pre-dot probe task followed by Verbal worry induction in which participants worried in a verbal way about a current concern of theirs for a total of 6 minutes, and then participants completed a post-dot probe task. Each dot probe task had three randomised SOAs: 200 ms, 750 ms and 1250ms, and lasted approximately 20 minutes. Each word pair contained one neutral word and one threat word. There were 40 word pairs in total, repeated once in each condition (Threat-Top/Probe-Top; Threat-Top/Probe-Bottom;

Threat-Bottom/Probe-Top; Threat-Bottom/Probe-Bottom), giving rise to 160 trials in each dot probe task. The dot probe tasks only differed by having different threat and neutral word stimuli.

Looking at the descriptive statistics did not unveil any obvious differences between RTs to probes replacing threat words compared with RTs to probes replacing neutral words, nor was there any obvious difference between RTs on the pre- or post-dot probe tasks. It was reasoned that a fatigue effect might be obscuring a difference between the pre- and post-dot probe tasks, as participants were becoming demonstrably tired (e.g., yawning) during the post-dot probe task. Although neither of the stimulus exposure latencies showed any obvious effect, the 200 ms latency showed the strongest trend toward an effect. It was reasoned that strategic avoidance might have set in by the later SOAs (cf. the vigilance avoidance hypothesis of Mogg et al., 2004). A latency of 200 ms was chosen for the next pilot, in order to counteract the effects of attentional avoidance at later SOAs (this was the SOA chosen by Mogg and Bradley [2006], which showed attentional bias for threat whereas SOAs of 500 and 2000 ms did not). An SOA of 200 ms would also be beneficial as it would make the dot probe task shorter in duration, thereby limiting the effects of fatigue on task performance.

2.2.2 Pilot two.

The purpose of the second pilot was to investigate whether an SOA of 200 ms would show an attentional bias effect on Threat-Neutral trials. Given that this adjusted dot probe task would be shorter also due to only one SOA being included, Neutral-Neutral trials were also included in order to see whether the current study could replicate the results of Oathes et al. (2010), in which worry led to a speeding on Threat-Neutral trials relative to

Neutral-Neutral trials. Nine participants were included in this pilot (five females and four males; mean PSWQ = 64).

There was only one dot probe task in pilot two in order to reduce fatigue effects. First of all, participants completed a verbal worry induction, identically to pilot one. The dot probe task then followed, which included 160 Threat-Neutral trials just like each of the dot probe tasks in pilot one. There were also 160 Neutral-Neutral trials, making a total of 320 trials. This dot probe task lasted approximately 15 minutes.

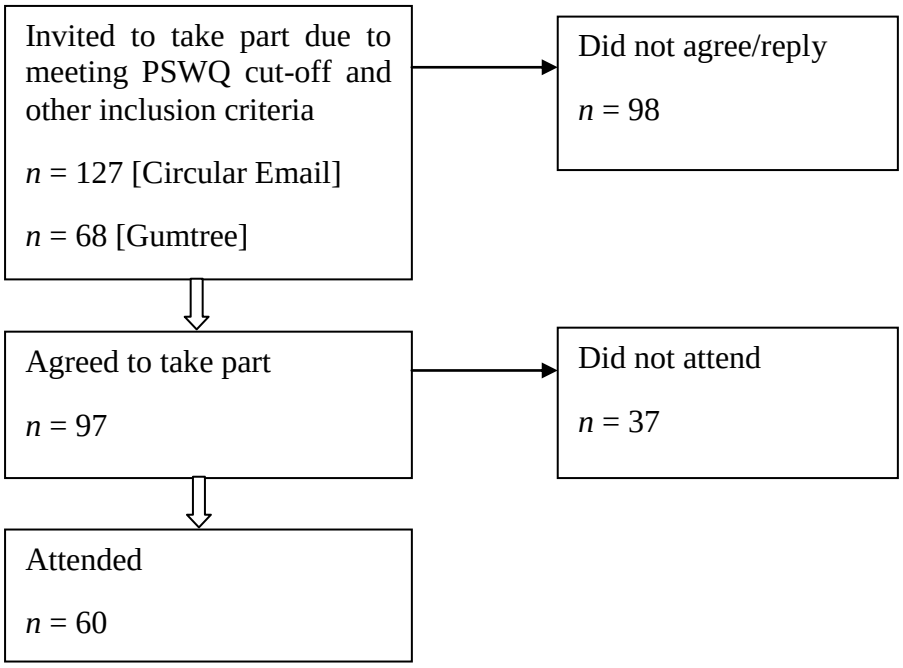
The descriptive statistics did not indicate any obvious differences between RTs to probes replacing threat words compared with RTs to probes replacing neutral words. There was a suggestion in the descriptive statistics of an effect of Trial Type (i.e., Threat-Neutral or Neutral-Neutral), in which mean RTs were faster on the former. This was in keeping with what Oathes et al. (2010) had found in their study. Based on these pilots, an SOA of 200 ms was chosen for the main experiment and Threat-Neutral and Neutral-Neutral word pairs were retained in order to repeat the analysis carried out by Oathes et al., as well as to help to pinpoint the nature of any attentional bias that might emerge (i.e., whether the engage or the disengage component of attention is affected).

2.3 Recruitment

An e-mail was sent via King's College London Circular to King's University staff and students, detailing inclusion/exclusion criteria for taking part in the study and inviting those who were interested to email the experimenter for more information. All those who indicated an interest received an information sheet for the study via email, as well as a consent form to read through (see Appendix 1). They were also sent the PSWQ to complete

and return to the experimenter. 55 or below were informed that they were not eligible to take part; those who scored 56 or above were invited to come to the Institute of Psychiatry, Kings College London to attend the experimental session. Participants were also recruited via an advert on Gumtree and those who registered an interest were dealt with in the same way. Figure 1 shows a flowchart of the different stages of recruitment.

Figure 1. Recruitment flowchart for participants recruited via email circulars and from Gumtree.



2.4 Sample Size Calculation

A power analysis was conducted to estimate the required sample size for the breathing focus task. The difference found in a study by Stokes and Hirsch (2010) between the mean frequency of negative intrusions post-worry in verbal and imagery groups (1.66) was entered into G*Power Version 3.1.2, along with the standard deviations of these groups (1.84 and 1.21, respectively), which estimated that both groups in the study would need a sample size of 15 in order to provide 80% power to detect an effect size of δ = 1.066, with an alpha level of 0.05.

As this was the first study of its kind to look at between-group differences in attentional bias following Verbal/Imagery training, it was not possible to conduct a power analysis by looking at previous research. However, it was already known that experimental manipulations in one domain of processing can affect congruent changes in other domains. For example, in a study by Hirsch, Mathews, Clark, Williams and Morrison (2003), low socially anxious participants instructed to imagine themselves in a given social situation demonstrated a benign inferential bias on an interpretation task, whereas this benign inferential bias was not evident for those participants who were instructed to hold in mind a negative self-image while performing the same interpretation task. Furthermore, pilot studies were conducted in order to test the sensitivity of this methodology to changes in attentional bias due to differences in how one engages in worry. Finally, the current study is conservative in including significantly more participants than that indicated in the power analysis for the breathing focus task, i.e., 25 per group rather than 15 per group, increasing its chances of detecting a significant effect in the dot-probe task should one exist.

2.5 Inclusion and Exclusion Criteria

Participants were only included in the study if they spoke English as their first language, were between 18 and 65 years of age and had high levels of worry, as indicated by a score of 56 or above on the PSWQ. Five people were excluded on the basis of no longer meeting cut-off on the PSWQ on attending.

Participants were excluded from the study if they failed to reach the required level of thinking on the final Scenario Scale of the worry training phase (see Section 2.7.4.3), i.e., no less than 60% in their designated thinking style (verbal or imagery-based) and no more than 40% in their non-designated thinking style (verbal or imagery-based).

Participants were also excluded from the study if their failed to think negative thoughts at least 60% of the time on this final Scenario Scale. All participants reached these criteria by the end of the worry training phase, except for two from the Imagery group who requested that the experimental session be discontinued due to finding the training to be stressful. A Fisher's Exact Test found no significant difference between the Verbal and Imagery groups on the number of participants who were excluded for this reason (See Table 1).

Participants were excluded from the study if they failed to reach the required level of thinking in their designated thinking style in either the first or middle worry phase. A Fisher's Exact Test found no significant difference between the Verbal and Imagery groups on the number of participants who were excluded for this reason (See Table 1). Participants were also excluded if they did not reach the required level of negative thinking on either of the Manipulation Check Scales (see Section 2.7.4.4) following the first worry phase or following the middle worry phase (same requirements as for the final Scenario Scale of the worry training phase).

Table 1. Participants excluded from Verbal and Imagery groups.

	Group	*N*	Fisher's exact test *p* value
<60% designated or >40% non-designated thinking style in first or middle worry phases	Verbal	2	.352
	Imagery	1	
	Imagery	0	
Did not wish to continue with experiment	Verbal	0	.491
	Imagery	2	

2.6 Materials

2.6.1 Generating and piloting the word stimuli.

Word stimuli were taken from the American Heritage Word Frequency Book (Carroll, Davies & Richman, 1971) and each pair of words was matched on word length (i.e., number of letters). Forty Threat-Neutral word pairs and 40 Neutral-Neutral word pairs were developed. The Threat-Neutral and Neutral-Neutral word pair groups were matched for word frequency on the Standard Frequency Index (SFI) as well as word length. Within the Threat-Neutral word corpus, the average SFI of threat-related words was matched with that of the neutral words.

Threat-related words were chosen to fit the domains of worry identified by Tallis, Eysenck and Mathews (1992) in the development of the Worry Domains Questionnaire (WDQ). The domains are: Relationships, lack of confidence, aimless future, work incompetence, financial and socio-political, and the authors identified five subdomains within each domain. Two domains were added in the current study: Physical and social, as it was felt from clinical experience that these prevalent worry domains should be represented. Five subdomains were added to these two domains. Some threat words were picked from MacLeod and McLaughlin's (1995) word set, whereas others were chosen separately at the experimenter's discretion in order to represent all the domains. One word was chosen for each subdomain for the eight domains, giving 40 threat words.

A word rating program was administered to seven participants and only those words with a mean rating of -1 or below (i.e., at least "mildly threatening") were included. It proved difficult to find threat-related words that were both sufficiently threatening and

representative of their subdomain. It was judged more important for a word to be threatening; therefore, words for some subdomains were substituted for words from another subdomain ascribed a higher mean threat rating by the participants.

Neutral-Neutral word pairs did not fall under particular categories. Some were chosen from MacLeod and McLaughlin's (1995) word set, others were taken from the word set used by Oathes et al. (2010) in their study (via personal correspondence), whereas others were chosen by the experimenter. The Threat-Neutral and Neutral-Neutral word pairs of the dot probe practice task and the two halves of the main dot probe task, as well as the worry domains of the Threat-Neutral pairs, are to be found in Appendices 2 and 3.

2.6.2 Scenarios.

Six worry scenarios used by the research team were used, the first four of which represented the following worry domains: Financial, social, physical and relationship. The last two scenarios represented a mixture of worries.

2.7 Measures

2.7.1 Penn State Worry Questionnaire.

The PSWQ (Meyer et al., 1990) is a measure of worry that has good psychometric properties in student, community, and clinical samples, with studies reporting high internal consistency, short-term retest reliability, and convergent and criterion related validity (Brown, Antony, & Barlow, 1992; Davey, 1993). Prior research with college samples (Molina & Borkovec, 1994) found a PSWQ score of 56 to fall one standard deviation below the mean of individuals diagnosed with GAD by the Anxiety Disorders Interview

Schedule for DSM-IV (ADIS-IV; Brown, Di Nardo, & Barlow, 1994). Participants in the present study were classed as being high worriers if they scored 56 or above on the PSWQ.

2.7.2 Spielberger state-trait anxiety inventory (STAI-trait).

The STAI-trait (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) was administered, which is a measure of trait anxiety. The STAI-trait has demonstrated good convergent validity (Peterson & Reiss, 1987; Merckelbach, De Jong & Muris, 1990), concurrent validity (Spielberger et al., 1995) and construct validity (Smeets, Merckelbach & Griez, 1997). Its test-retest reliability is also good (Rule & Traver, 1983).

2.7.3 Worry Domains Questionnaire.

The WDQ (Tallis, Eysenck & Mathews, 1992) is a measure of worry. One hundred and fifty five worry items were chosen from the statements of a voluntary community sample and these were entered into a cluster analysis, resulting in various worry domains. Although only the five most frequently endorsed domains were included in the final questionnaire, this study included all six domains, to maximise the range of worries represented in the word stimuli (see Section 2.6.1). Diefenbach et al. (2001) showed the WDQ to have adequate internal consistency for clinical and control populations.

A modified version of the WDQ was given to participants during the study, which included four extra items, two reflecting social worries, two reflecting physical worries.

2.7.4 Visual analogue scales.

See Appendices 4-8 for copies of the Visual Analogue Scales.

2.7.4.1 Mood rating scales.

Three Mood Rating Scales were completed by participants at various points during the study (see Section 2.10.4). Each comprised a 10 cm line flanked by two words. For the anxiety visual analogue scale, the words were “not at all anxious” and “extremely anxious”. For the depression visual analogue scale, the words were “not at all depressed” and “extremely depressed”. For the happiness visual analogue scale, the words were “not at all happy” and “extremely happy”. Participants indicated their current mood on the Mood Rating Scales by marking a cross (x) on each scale at some point between the two extremes.

Mood Rating Scales administered during each of the three worry phases included an extra question asking participants to rate the extent to which they were currently distressed about their worry topic (0 – 100).

2.7.4.2 Worry rating scales.

On the Worry Rating Scale participants rated the extent to which each identified worry was “Personally Relevant” and “Distressing”, by marking a cross somewhere on a 10 cm line between two extremes which represented “Not at all” and “Totally”.

2.7.4.3 Scenario scales.

After reading the practice scenario in the worry training phase participants completed the Practice Scenario Scale, in which they rated on a scale of 0 - 100 the extent to which they were thinking in their designated thinking style (Verbal or Imagery) and the extent to which they were thinking in their non-designated thinking style.

After reading each of the scenarios in the worry training phase participants completed a Scenario Scale, the first part of which was identical to the practice scenario

scale, but which also required participants to rate the proportion of their thinking that was positive, negative and neutral during the time they thought about the scenario as well as the extent to which the scenario represented something that had been concerning them recently ("not at all", "moderately", "highly", "extremely").

2.7.4.4 Manipulation check scales.

Participants completed Manipulation Check Scales after each of the three worry phases in order to ensure that they had been thinking according to their designated thinking style as well as reaching the required level of negative thinking. These scales required participants to rate on a scale of 0 – 100 the extent to which they were thinking in their designated thinking style and the extent to which they were thinking in their non-designated thinking style, and also to rate the proportion of their thinking that was positive, negative and neutral during the time they were worrying.

2.8 Experimental Tasks

2.8.1 Dot probe training task.

Participants were asked to sit at a laptop (Sony Vaio) and were provided verbal and computer-generated instructions informing them of the nature of the task. These instructions explained that a series of visual displays consisting of two words, separated vertically by approximately 3 cm, would be presented on the computer monitor. Participants were told that a symbol, either "." or ".." would appear immediately following the disappearance of the word pair in either the position of the top or bottom word, which would require one of two responses each time: Pressing either "c" or "m" on the keyboard (which were labelled with "." and "..", respectively), to match the symbol on the screen.

They were told to respond to the dot as quickly as possible without making mistakes. Participants then completed five trials as practice.

Each practice trial consisted of a fixation cross presented for 1000 ms in the middle of the screen, followed by two words presented vertically – all Neutral-Neutral word pairs. Each word pair was presented for 200 ms before the presentation of a small dot probe, replacing one of the words.

The dot probe training task was made a separate task that took place before the experimental manipulation (the first worry phase) rather than taking place just before the main dot probe task, in order to minimise the dissipation of worry before participants commenced the main dot probe task.

2.8.2 Worry training phase.

Participants in the Verbal group were asked to think in words, sentences and questions about the topic of "friendship" for 30 seconds, as a practice task. Those in the Imagery group were asked to imagine a scenario relating to the concept of "friendship" using all their senses, for 30 seconds. Following this practice scenario, participants went on to think about four negative scenarios in the same way, depending on their designated thinking style, particularly focusing on each scenario as if it were happening to them and focusing on the negative aspects of each scenario. Participants were asked to think about scenarios one to four for 1 minute, 1 ½ minutes, 2 minutes and 2 minutes, respectively. Participants were only administered scenario five if they had not reached the required level of thinking on scenario four, i.e., no less than 60% in their designated thinking style and no more than 40% in their non-designated thinking style, as well thinking negative thoughts at

least 60% of the time. Participants were only administered scenario six if they had not reached these criteria on scenario five.

2.8.3 First worry phase.

Participants' first identified worry topic was briefly discussed with the experimenter in order to activate the worry in the participant's mind and to ensure that it was connected with a negative future event. Participants went on to worry for three blocks of 2 minutes each, in either a verbal or imagery-based way depending on their group allocation. The experimenter left the room to begin each worry period and returned at the end of each 2 minute block. This phase was intended to activate the worry process before the dot probe task (first half).

2.8.4 Dot probe task (first half).

Participants completed the first half of the dot probe task. As in the dot probe training task, each trial began with a fixation cross presented for 1000 ms in the middle of the screen, followed by the presentation of a word pair. Half the trials displayed a Threat-Neutral word pair and half a Neutral-Neutral word pair. Each Threat-Neutral pair was presented once in all four conditions (Threat-Top/Probe-Top; Threat-Top/Probe-Bottom; Threat-Bottom/Probe-Top; Threat-Bottom/Probe-Bottom), such that each threat word was presented equally often in the top location as in the bottom location. The order of word pair presentations was randomised.

On each trial, the word pair was presented for 200 ms, after which a symbol was presented immediately (either "." or ".."), replacing the top word on half the trials and replacing the bottom word on half the trials. The two symbols were presented an equal

number of times in total. Participants were instructed to respond by pressing either “c” or “m” on the keyboard (which were labelled with “.” and “..”, respectively), to match the symbol on the screen. They were told to respond to the dot as quickly as possible without making mistakes. This half lasted about 10 minutes.

2.8.5 Middle worry phase.

After the first half of the dot probe task there came a break, during which participants were asked to think about their worry topic for another 2 minutes in the same way as during the first worry phase, in order to reactivate their worry. The experimenter left the room for these 2 minutes. This phase was intended to re-activate worry before proceeding to the dot probe task (second half), as it was reasoned that worry would be likely to dissipate during the first half of the dot probe task.

2.8.6 Dot probe task (second half).

Participants then completed the second half of the dot-probe task, identical to the first half, except for different word pairs. This half also lasted about 10 minutes.

2.8.7 Word rating task.

Participants were asked to use a four-point scale to rate how related each of the 40 threat words they had seen in the dot probe task was to what they had just been worrying about as the experimenter left the room during all the preceding worry periods. This ranged from “not at all related”, “slightly related”, “moderately related”, to “extremely related”. Participants were instructed to include in this rating of relatedness all the things that had come to mind during the first and middle worry phases, whether it related to what they had

agreed to worry about or whether it was extraneous material that had come to mind during the worry phases.

2.8.8 Breathing focus training task.

Participants were instructed to focus their attention on their breathing for a 20 second practice, and not to concentrate on anything expect their breathing. They were told to notice when the mind had wandered during this task and then to bring their attention back to their breathing whenever this happened. Following this, participants were asked to do the same for an additional 45 seconds, as the computer generated a beep at random intervals. For each beep, each participant was asked to say "breathing" if they were focusing on their breathing at that point or to indicate where their mind had wandered to at that point, by saying "positive", "neutral" or "negative" to indicate the contents of their thoughts, followed by one word to describe the content. Participants heard three beeps in total.

The breathing focus training phase was made a separate task that took place before the experimental manipulation (the second worry phase) rather than taking place just before the main breathing focus task, in order to minimise the dissipation of worry before participants commenced the main breathing focus task.

2.8.9 Second worry phase.

Participants' second identified worry topic was briefly discussed with the experimenter in order to activate the worry in the participant's mind and to ensure that it was connected with a negative future event. Participants went on to worry for three blocks of 2 minutes each, in either a verbal or imagery-based way depending on their group

allocation. The experimenter left the room to begin each worry period and returned at the end of each 2 minute block. The second worry phase was intended to activate worry for the breathing focus task.

2.8.10 Breathing focus task.

Participants were asked to focus on their breathing just as before, for 5 minutes this time, as the computer generated beeps at random intervals. For each beep, participants were again asked say "breathing" if they were focusing on their breathing at that point or to indicate where their mind had wandered to at that point, by saying "positive", "neutral" or "negative" to indicate the contents of their thoughts, followed by one word to describe the content. Participants heard 12 beeps in total.

2.8.11 Expanded descriptions.

Participants were asked to expand on the summaries they provided for each intrusion occurring during the training and main breathing focus task for an independent rater to categorise each of these as positive, neutral or negative in valence.

2.9 Design

This study adopted a mixed-model 2 x 2 x 2 design with one between-subjects factor of Group (Verbal; Imagery) and two within-subjects factors: Threat Position (Top; Bottom); Probe Position (Top; Bottom). The four combinations of threat position and probe position can be represented by Condition (Threat-Top/Probe-Top; Threat-Top/Probe-bottom; Threat-Bottom/Probe-Top; Threat-Bottom/Probe-Bottom). The dependent variable was RT.

2.10 Procedure

2.10.1 Randomisation.

Participants were randomised using a random number table, in which the first number represented the first participant, the second number the second participant, and so on. An even number randomised participants to the Verbal group, and an odd number to the Imagery group. After testing 30 participants, the mean age and PSWQ score of the groups were calculated, and randomisation then became stratified for these variables in order to generate groups with approximately equal mean age and PSWQ scores. Participant gender randomisation also became stratified after 30 participants in order to ensure a roughly equal gender ratio of the two groups.

2.10.2 Payment.

Participants were paid £15 for attending before the experimental session began.

2.10.3 Verbal overview, information sheet and consent form.

Before commencing the experimental session, participants were given a brief verbal overview of how the study would run and it was explained that the study could cause some distress. Participants were reassured that they could stop the study and leave at any time without giving a reason, should they feel the need to do so. Participants were then given an information sheet to read through and then a consent form to sign if they agreed to take part in the study.

2.10.4 Experimental protocol.

The experimental protocol was conducted by one experimenter. On attending the experimental session participants were given to complete the PSWQ, the modified WDQ, the STAI-trait and the Mood Rating Scales. After this point, it is helpful to conceptualise the experimental session as divided into two parts that centre on two different experimental tasks. Part one centres on the dot probe task and part two centres on the breathing focus task.

2.10.4.1 Part one: Dot probe task.

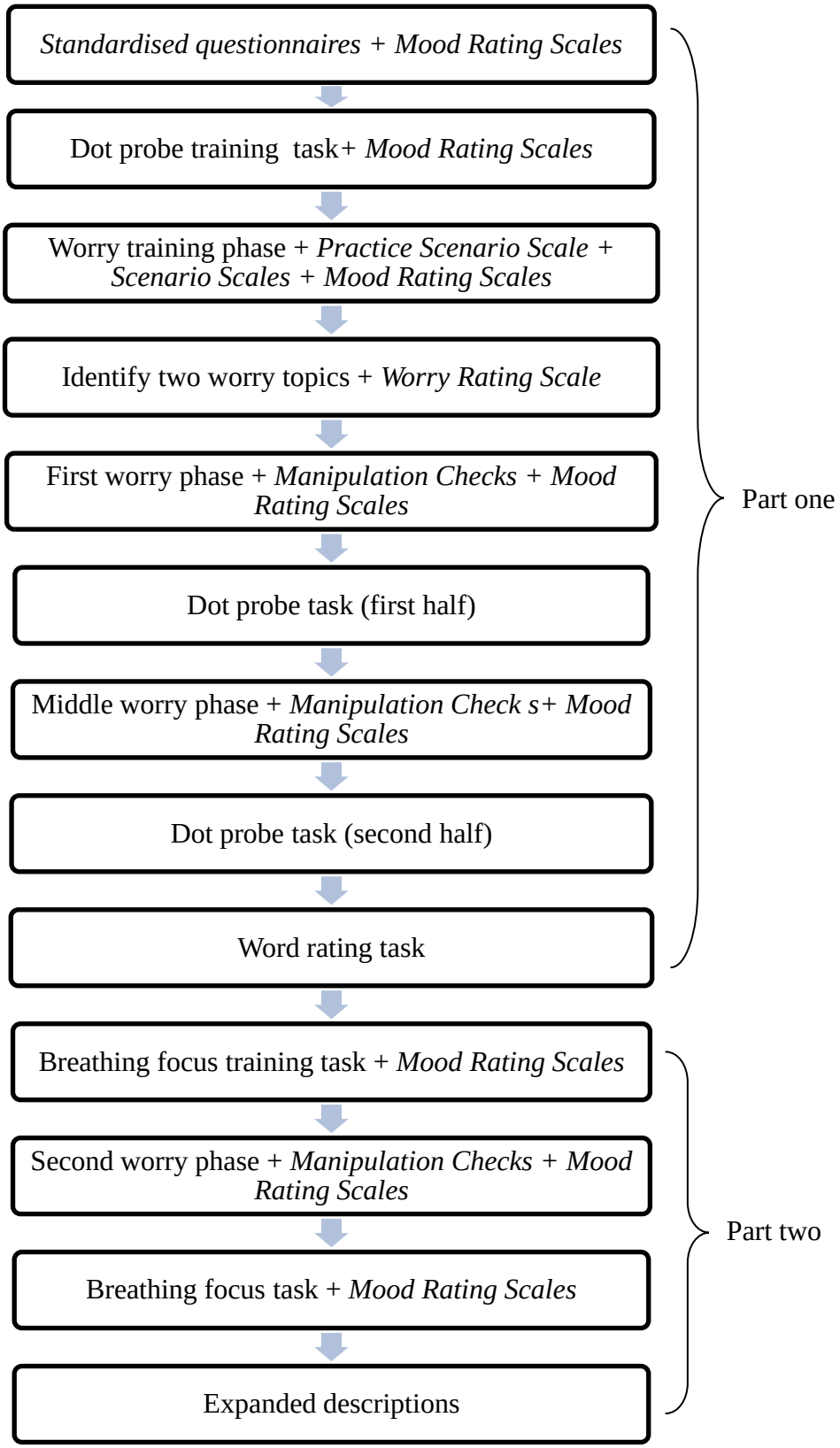
Firstly, participants entered the dot probe task training phase. At the end of the dot probe training task participants completed the Mood Rating Scales. Participants then underwent the worry training phase, completing the Practice Scenario Scale after thinking about the practice scenario and then completing a Scenario Scale after thinking about each of the subsequent scenarios. Participants completed the Mood Rating Scales at the end of the worry training phase.

Participants were then asked to identify two topics that they had been worrying about recently and completed the Worry Rating Scale. Participants then entered the first worry phase, at the end of which they completed one Manipulation Check Scale retrospectively for each 2 minute worry period and also completed the Mood Rating Scales. Following the first worry phase, participants completed the dot probe task (first half). Then participants entered the middle worry phase and completed a Manipulation Check Sheet for this 2 minute worry period as well as the Mood Rating Scales. Participants then completed the dot probe task (second half), before completing the word rating task.

2.10.4.2 Part two: Breathing focus task.

Part two of the study began with the breathing focus training task. After the breathing focus training task participants completed the Mood Rating Scales, before entering the second worry phase. At the end of the second worry phase, participants completed one Manipulation Check Scale retrospectively for each 2 minute worry period, also completing the Mood Rating Scales. Participants then completed the breathing focus task and then the Mood Rating Scales, before finally completing the expanded descriptions. Figure 2 shows a visual flowchart of the experimental protocol.

Figure 2. Flow chart of the experimental procedure (words in italics are questionnaires).



2.11 Ethical Considerations

The principal ethical consideration in the study related to the potential for distress to participants during the experiment. The experimental manipulation of worry induction was deemed likely to increase levels of distress to some degree, although, based on previous experience of inducing worry in research participants, this effect was expected to be short-lived and to be something that would dissipate rapidly on switching tasks. It was also anticipated that the training phase of the experiment, in which participants would be asked to either think to themselves about different negative scenarios happening to them (Verbal group) or to imagine themselves in those scenarios (Imagery group) could raise distress levels, although, again, this was expected to be short-lived. Viewing threat-related words on the screen during the dot-probe task was also considered to be a possible source of distress. It was also predicted that some participants might feel uncomfortable disclosing personal thoughts, either in the reporting of two current worries of theirs or in the reporting of intrusions during the breathing focus task.

One method for addressing these issues was to list them in the information sheet and the aforementioned potential sources of distress were verbally explained to participants at the beginning of the experimental session. It was also stressed at the beginning of the experimental session that they were entitled to stop the study and leave at any point without giving a reason. If distress or discomfort was observed in the participant during the study, they were reminded of this option. Finally, distress and discomfort routinely discussed during the debriefing session at the end of the experiment and any residual negative emotional effects from the experiment were met with empathy and understanding by the

experimenter. Participants who wanted to know about methods of dealing with day-to-day worry were signposted to books and/or services that could offer support in this regard.

Another ethical issue relates to confidentiality. Although all information gained from participants during the study was kept confidential, it was anticipated that some participants might disclose information indicating such a level of risk to themselves or others that a third party might need to be contacted. Participants were made aware of this in the information sheet.

Another ethical consideration was whether participants should be told their score on the PSWQ, which they completed in order that the experimenter could screen for high-worriers. It was decided that participants should not be informed of their score, as providing people with a score out of context would be meaningless for them. Rather, those who did not meet cut-off on the PSWQ were told that they did not meet the cut-off required in order to take part in the study. Those participants that expressed surprise or shock at this were informed that the PSWQ is not necessarily a true reflection of how distressing worry is for them and, if they feel that they are a high-worrier, their PSWQ score does not invalidate that in anyway.

Finally, this study did not including those whose first language was not English. This was felt appropriate as the dot probe task looks at subtle differences in RTs to English words. This was explained over the phone or face to face to participants who were excluded from the study for this reason.

Ethical approval was obtained from the King's College London ethics committee before the start of recruitment (reference number: PNM/10/11-71).

Chapter 3

Results

3.1 Preparation of Reaction Time Data from the Dot Probe Task

Data from both halves of the dot probe task were analysed together. Trials in which participants pressed the incorrect key were excluded from statistical analyses. The range of trials on which no errors were made was 88-100% and the mean accuracy was 98%. Median scores were extracted for each participant for every condition in the analyses in order to limit the effect of outlier RTs at extreme latencies.

For each analysis that follows, data characteristics were examined for normality[1] and homogeneity of variance[2]. When any of these criteria were not met, this is noted along with any adjustments that were made to analyses.

3.2 Sample Characteristics

3.2.1 Between-groups comparisons.

The two groups were compared on various measures to ensure that they were matched in all important respects apart from the experimental manipulation (see Table 2 for all analyses and results). For part one (dot probe task), there were 25 participants in each

[1] Normality was judged by visual inspection of Q-Q plots, the absence of extreme outliers (defined as SD > 2.5 beyond the mean) and skewness and kurtosis within |2|.

[2] For ANOVAs, homogeneity of variances was deemed present if, in between-groups comparisons, the largest SD was not more than twice as large as the lowest between all the conditions being compared. For within-groups comparisons, Mauchly's Test of Sphericity was taken to indicate sphericity if $p > .05$. For independent samples *t*-tests, Levene's test for equality of variances was taken to indicate homogeneity of variances if $p > .05$. For paired samples *t*-tests, the Pitman-Morgan test was taken to indicate homogeneity of variances if $p > .05$.

group. Some participants from both groups did not complete the second part of the study, leaving a total of 42 participants who provided data for the second part of the study (breathing focus task) in addition to the first part (dot probe task). In both parts of the study, the groups did not differ significantly in PSWQ, STAI-trait, age or gender ratio, and picked worries that were matched for distress and personal relevance. There were no differences between the two groups in either part of the study with regard to anxiety and depression scores on the Mood Rating Scales following the worry periods, although in part two of the study the Verbal group had significantly lower happiness scores on the Mood Rating Scales following the second worry phase.

Table 2. Between-groups comparisons of demographics and scores on various measures in both parts of the experiment.

Part one (dot probe task)		Verbal [SD] [*n* = 25]	Imagery [SD] [*n* = 25]	Test	Statistic and *p* value
PSWQ		65.680 [6.5238]	65.6800 [5.3985]	Independent samples *t*-test	$t(48) = .590$; $p = .558$
STAI-trait		57.360 [7.8150]	55.520 [8.4810]	Independent samples *t*-test	$t(48) = .798$; $p = .429$
Age		26.680 [8.6973]	26.0800 [8.7270]	Mann-Whitney's U Test	$Z = -.175$; $p = .861$
Gender		20 females	21 females	Fisher's Exact Test Significance Level *p*	1.0
Anxiety	First worry phase	7.312 [1.7913]	7.036 [2.1620]	Mann-Whitney's U Test	$Z = -.340$; $p = .734$
	Middle worry phase	6.980 [1.7088]	7.092 [1.7272]	Mann-Whitney's U Test	$Z = -.728$, $p = .466$
Depression	First worry phase	5.736 [2.8918]	5.156 [2.8088]	MANOVA	$F(1, 48) = .517$; $p = .475$; $\eta^2 = .011$
	Middle worry phase	5.456 [2.7377]	4.908 [2.5982]	MANOVA	$F(1, 48) = .527$, $p = .471$, $\eta^2 = .011$
Happiness	First worry phase	3.704 [2.2238]	3.312 [1.7510]	MANOVA	$F(1, 48) = .480$, $p = .492$, $\eta^2 = .010$
	Middle worry phase	3.408 [1.5780]	3.784 [2.0087]	MANOVA	$F(1, 48) = .542$, $p = .465$, $\eta^2 = .011$
Worry one distress		7.960 [1.5703]	7.600 [1.6540]	Independent-samples *t*-test	$t(48) = .789$, $p = .434$
Worry one personal relevance		8.780 [1.2721]	8.600 [1.3829]	Independent-samples *t*-test	$t(48) = .479$, $p = .634$

Part two (breathing focus task)		Verbal [SD] [*n* = 20]	Imagery [SD] [*n* = 22]	Test	Statistic and *p* value
PSWQ		64.7000 [6.39161]	65.6364 [5.53384]	Independent samples *t*-test	$t(40) = .509$; $p = .614$
STAI-trait		57.9000 [7.28300]	56.2273 [8.51291]	Independent samples *t*-test	$t(40) = .681$; $p = .500$
Age		26.680 [8.6973]	26.0800 [8.7270]	Mann-Whitney's U Test	$Z = -.455$; $P = .649$
Gender		17 females	18 females	Fisher's Exact Test	$p = .762$
Anxiety	Second worry phase	7.2050 [1.8972]	6.4545 [2.1852]	Mann-Whitney's U Test	$Z = -1.323$; $p = .186$
Depression	Second worry phase	5.6850 [3.08550]	4.4045 [2.98671]	Independent-samples *t*-test	$t(48) = 1.366$; $p = .180$
Happiness	Second worry phase	2.7600 [1.61552]	3.8818 [1.94634]	Independent-samples *t*-test	$t(40) = -2.021$; $p = .050$
Worry two distress		7.965 [2.1139]	7.9318 [1.5270]	Independent-samples *t*-test	$t(40) = .059$, $p = .953$
Worry two personal relevance		8.540 [1.8841]	9.0909 [1.0592]	Independent-samples *t*-test	$t(40) = -1.153$, $p = .258$

Note: Numbers in curved brackets = degrees of freedom; η^2 = effect size.

Analyses were conducted to investigate differential drop out effects in part two of the study. There was no disproportionate exclusion of participants in either group in part two of the study due to either reason for exclusion: Not reach the minimum amount of thinking in the designated thinking style (60%) during the last 2 minutes of the second worry phase; Not reaching the minimum amount of negative thinking (60%) in those 2 minutes; Not wishing to continue on to the second part of the study (see Table 3).

Table 3. Numbers of participants excluded from Verbal and Imagery groups due to three criteria.

	Group	*N*	Fishers exact test *p* value
<60% designated or >40% non-designated thinking style in last 2 minutes of second worry phase	Verbal	1	1.0
	Imagery	0	
<60% negative thoughts in last 2 minutes of second worry phase	Verbal	2	1.0
	Imagery	3	
Did not wish to continue to second part of experiment	Verbal	2	.490
	Imagery	0	

3.2.2 Within-groups comparisons.

As the experimental session was long and involved many tasks, it was deemed important to investigate fatigue effects (see Table 4 for all analyses and results). As fatigue might manifest in participants' mood, within-groups analyses were conducted to compare levels of anxiety on the Mood Rating Scales following worry phase, and no significant difference was found. However, levels of anxiety on the Mood Rating Scales were found to be significantly higher following the first worry phase than the second worry phase.

The relatively lesser anxiety reported by the Imagery group after the second worry phase compared with the first did not seem to be due to participants having chosen significantly less anxiety-provoking second worries than first worries, as no significant differences were found in either group between the extent to which participants had initially rated each of their worries as distressing.

It was reasoned that adherence to thinking style might also correlate with fatigue. There was a significant difference in the Verbal group between adherence to designated thinking style in the final 2 minutes of the first worry phase and in the final 2 minutes of the

second worry phase, in which participants thought significantly less in a verbal way in the final 2 minutes of the second worry phase than the final two minutes of the first worry phase. In the Imagery group, no such difference was found.

Table 4. Within-groups comparisons of scores on various measures.

	Verbal [*n* = 20]	Test	Statistic and *p* value	Imagery [*n* = 22]	Test	Statistic and *p* value
Mean anxiety first worry phase [SD]	7.5100 [1.8476]	Wilcoxon Signed Ranks Test	*Z* = -.765, *p* = .444	7.2591 [1.9148]	Paired-samples *t*-test	*t*(21) = 2.634; *p* = .015
Mean anxiety second worry phase [SD]	7.2050 [1.8972]			6.4545 [2.1852]		
Mean initial rating of distress worry one [SD]	7.9900 [1.6267]	Paired-samples *t*-test	*t*(19) = .061, *p* = .952	7.6409 [1.7508]	Paired-samples *t*-test	*t*(21) = 0.627; *p* = .537
Mean initial rating of distress worry two [SD]	7.9650 [2.1137]			7.9318 [1.5270]		
Mean designated thinking style last 2 minutes worry one [SD]	93.3000 [6.5623]	Paired-samples *t*-test	*t*(19) = 2.098, *p* = .050	87.3636 [12.2884]	Paired-samples *t*-test	*t*(21) = .333; *p* = .743
Mean designated thinking style last 2 minutes worry two [SD]	89.5000 [9.0176]			86.5000 [12.8536]		

Note: Numbers in curbed brackets = degrees of freedom.

3.3 Hypothesis One: Inducing Verbal Worry Leads to a Stronger Attentional Bias for Threat-Related Words on the Dot Probe Task than Inducing Imagery-Based Worry

3.3.1 Congruency effect.

As the presence of attentional bias has been traditionally investigated by looking at the congruency effect of Threat Position x Probe Position (e.g., Mogg, Mathews & Eysenck, 1992), a mixed-model 2 x 2 x 2 ANOVA was performed with these variables as within-subjects factors and Group as a between-subjects factor. Neutral-Neutral trials were not included in this analysis as they do not contain a threat word to be probed.

Although Q-Q plots of the four within-subjects Conditions to be entered into the ANOVA, resulting from four combinations of threat location and probe location (Threat Top/Probe Top; Threat Top/Probe Bottom; Threat Bottom/Probe Top; Threat Bottom/Probe Bottom) were found to be approximately normal, two extreme outliers were found in the box plots, both in the Imagery group[3]. Analyses were performed with extreme outliers included. When analyses were repeated excluding extreme outliers, all significant effects were retained (see Appendix 9).

The mixed-model 2 x 2 x 2 ANOVA analysis with extreme outliers included revealed a main effect of Probe Position ($F(1, 48) = 94.528$, $p < 0.001$, $\eta^2 = .663$). The estimated marginal mean scores indicated faster responses to probes appearing in the Top position than the Bottom (see Table 5).

Table 5. Means and standard errors of probes by location.

[3] A logarithmic transformation was conducted but these outliers remained, therefore this transformation was not used.

Probe Position	Estimated marginal mean [*n* = 50]	Standard error
Top	500.275	8.270
Bottom	520.785	8.824

This was qualified by an interaction effect of Probe Position x Group ($F(1, 48) = 6.306$, $p = .015$, $\eta^2 = .116$), in which the speeding toward probes in the top position relative to those in the bottom position was significantly less in the Verbal group compared with the Imagery group.

Although there was no interaction effect of Threat Position x Probe Position ($F(1, 48) = 1.121$, $p = .295$, $\eta^2 = .023$), a significant three-way interaction was obtained: Threat Position x Probe Position x Group ($F(1, 48) = 5.156$, $p = .028$, $\eta^2 = .097$). There was no significant main effect of Group ($F(1, 48) = 1.053$; $p = .310$; $\eta^2 = .021$).

This three-way interaction prompted further analyses as to its nature. Two separate repeated measures ANOVAS were conducted for the Verbal and Imagery groups, retaining extreme outliers to begin with. When analyses were repeated excluding extreme outliers, all significant effects were retained (see Appendix 9).

A significant Threat Position x Probe Position interaction was found only for the Verbal group ($F(1, 24) = 4.275$, $p = .050$, $\eta^2 = .151$) as well as the main effect of Probe Position ($F(1, 24)$, $p < 0.001$, $\eta^2 = .440$). In the Imagery group the main effect of Probe Position held ($F(1, 24) = 120.724$, $p < .001$, $\eta^2 = .834$) but the Threat Position x Probe Position interaction was non-significant ($F(1, 24) = 1.044$, $p = .317$, $\eta^2 = .042$).

A series of Bonferroni-corrected pairwise comparisons (see Table 6) indicated that, while probes appearing on the Top received faster responses than probes appearing on the

Bottom in both Imagery and Verbal groups, only in the Verbal group was the speeding effect of probes appearing on the Top less when the threat word appeared at the Bottom (517 ms) than when the threat word also appeared at the Top (508.68 ms). Hence it seems that Threat Position moderates the effect of Probe Position only in the Verbal group. These results are summarised Figures 1 and 2.

Table 6. Pairwise comparisons of the Threat Position x Probe Position x Group interaction, with a Bonferroni correction for multiple comparisons.

Group	Threat Position	Probe Position		Mean RT (probe top – probe bottom)	Significance
		Top	Bottom		
Verbal [*n* = 25]	Top	508.68	538.70	-30.020	p < .001
	Bottom	517.00	532.24	-15.240	p = .011
Imagery [*n* = 25]	Top	488.92	524.62	-35.700	p < .001
	Bottom	486.5	527.58	-41.080	p < .001

Figures 3 and 4. Graphs of RTs by Condition (Threat Top/Probe Top; Threat Top/Probe Bottom; Threat Bottom/Probe Top; Threat Bottom/Probe Bottom), by Group.

Figure 3

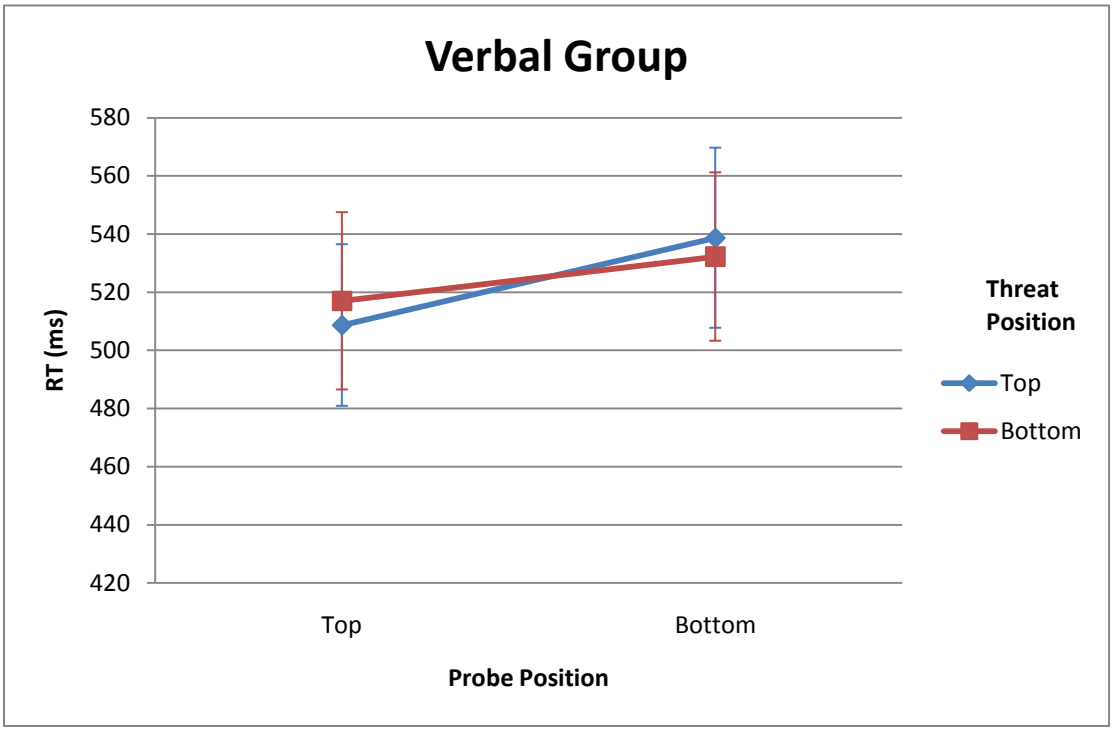
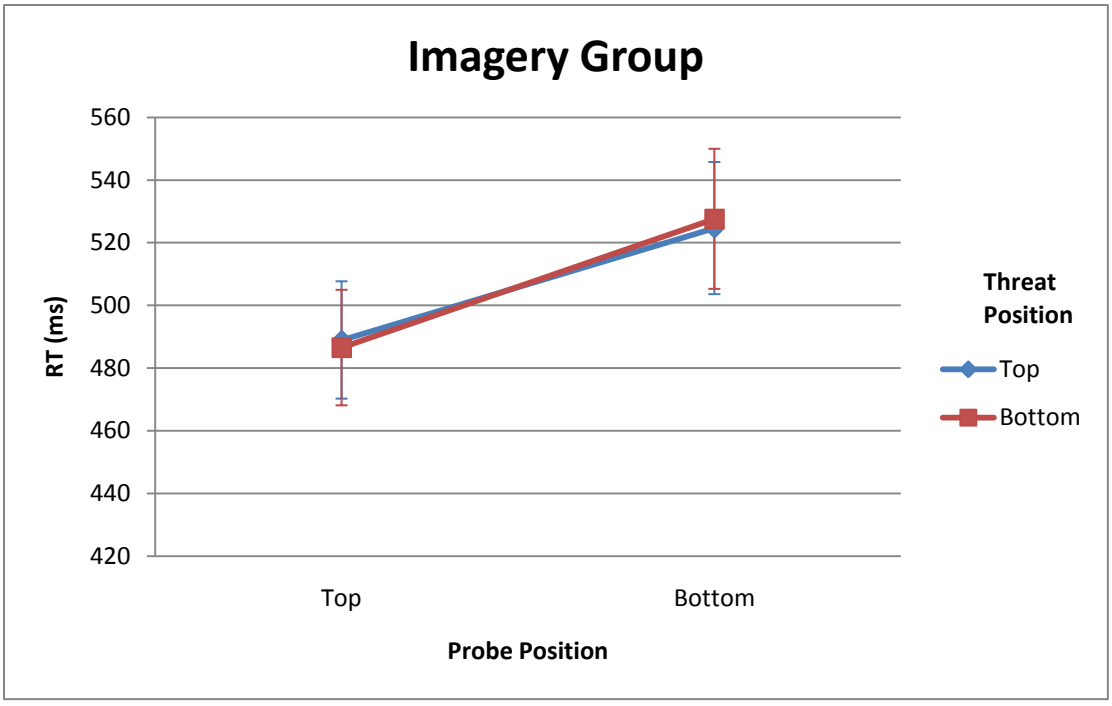


Figure 4



Note: Error bars denote 95% confidence intervals.

These graphs are comparable to those produced by MacLeod et al. (1986) as well as Mogg et al. (1992) in showing group differences in attentional bias for threat.

3.3.2 Attentional bias index.

To further investigate hypothesis one, the traditional Attentional Bias Index (ABI) was calculated for the two groups, using the following calculation:

RT to probes at neutral location – RT to probes at threat location.

(Conditions Threat-Top/Probe-Bottom and Threat-Bottom/Probe-Top that were entered into the 3-way ANOVA were collapsed to make "RT to probes at neutral location", whereas Threat-Top/Probe-Top and Threat-Bottom/Probe-Bottom were collapsed to make "RT to probes at threat location").[4]

Two one-sample *t*-tests compared ABI scores of the two groups with 0. The ABI score of the Verbal group was significantly larger than 0 ($t(24) = 2.068$, $p = .0050$; reflecting speeded responses to threat words relative to neutral words) whereas the ABI score of the Imagery group did not significantly differ from 0 ($t(24) = -2.6900$, $p = .317$). Means of these ABI scores are found in Table 7.

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[4] N.B. although the ABI scores that clarified the 3-way interaction were derived by collapsing the Conditions used in the 3-way ANOVA, ABI scores that are reported in subsequent sections were derived directly from the dataset by taking the median RTs of trials in which the threat word is probed and the median RTs of trials in which the threat word is not probed, and then producing ABI scores in the same fashion (i.e., RT to probes at neutral location – RT to probes at threat location).

Table 7. Mean ABI scores, by Group.

Group	Mean ABI [SD]
Verbal [*n* = 25]	7.390 [17.8712]
Imagery [*n* = 25]	-2.6900 [12.1651]

An independent samples *t*-test was also conducted, which showed the ABI score of the Verbal group to be significantly larger than the ABI score of the Imagery group ($t(48) = 2.271$), $p = .028$). This reflected significantly more speeded responses to threat words in the Verbal group relative to the Imagery group.

3.4 Hypothesis Two: There Will Be Specificity Effects in the Imagery Group, in Which Attentional Bias Will Be Evident toward Threat Words Relating to Participants' Specific Concerns, Whereas This Effect Will Not Be Present in the Verbal Group

3.4.1 Word rating task.

In order to examine any effect of relevance of threat words to what participants had worried about during the first and second worry phases, and how this might differ by Group, a four-way ANOVA was conducted with an additional within-subjects factor of Relevance (Relevance x Threat Position x Probe Position x Group). Relevance only included words that participants had rated as either "not at all related" or "highly related" to what they had thought about during the first worry phase. Four participants' data were removed from this analysis as they had not provided RT data for threat words that were not at all related or highly related to what they had worried about, either due to not having endorsed any words on the word rating task as falling into these categories, or due to the

exclusion of incorrect responses on the dot probe task (see Section 3.1). This resulted in unequal sample sizes[5] (Verbal: 21; Imagery: 25).

Some kurtosis and skewness values exceeded |2|, there were four extreme outliers in the Imagery group and two in the Verbal group, and the homogeneity of variance assumption was not met, as indicated by the highest standard deviation between the two groups being more than twice the size of the lowest. A logarithmic transformation did not resolve these issues; therefore, a reciprocal (1/x) transformation was performed on the data, which provided homogeneous variances and skewness values within |2|, and also resolved extreme outliers. One kurtosis value remained outside of |2| but this was not deemed too problematic as visual inspection of the relevant Q-Q plot and histogram indicated an approximately normal, unimodal distribution; therefore, the analysis was still conducted. The four-way interaction of interest (Relevance x Threat Position x Probe Position x Group) was non-significant ($F(1, 44) = .431$; $p = .515$, $\eta^2 = .010$).

An additional method for examining any effect of relevance of threat words to what participants had worried about in the first and middle worry phases was to calculate the ABI for the same two relevance ratings (not at all related; highly related). ABI was entered as dependent variables into a mixed-model 2 x 2 ANOVA with a within-subjects factor of Relevance (Not At All Related; Highly Related) and a between-subjects factor of Group (Verbal; Imagery). There were unequal sample sizes here for the same reasons as in the

[5] Although unequal sample sizes can exaggerate the consequences of homogeneity of variances (Myers & Well, 1995), the homogeneity of variance assumption held in all analyses in which there were unequal sample sizes and therefore unequal samples were unlikely to have strongly impacted on the results.

previous analysis (Verbal: 22; Imagery: 25). There was no main effect of Relevance ($F(1, 45) = .484$, $p = .490$, $\eta^2 = .011$) nor a Relevance x Group interaction ($F(1, 45) = .181$, $p = .672$, $\eta^2 = .004$).

A "highest" and "lowest" domain was calculated for each participant by adding up the relevance values each participant had allocated to each threat word on the word rating task (0 = not at all related; 1 = mildly related; 2 = moderately related; 3 = highly related), and then assigning each participant with their highest and lowest worry domain, from the following: 1. Relationships; 2. Lack of confidence; 3. Aimless Future; 4. Work incompetence; 5. Financial; 6. Socio-political; 7. Physical; 8. Social. If there were two or more domains calculated as highest/lowest then the domain that comes first in the arbitrary sequence shown above was chosen.

Domain (Highest/Lowest) was entered into a four-way ANOVA (Domain x Threat Position x Probe Position x Group). There were equal sample sizes in this analysis ($n = 25$ for both groups). Some kurtosis and skewness values exceeded |2|, which was resolved following a logarithmic transformation, although there remained one extreme outlier in the Verbal group and three in the Imagery group. The four-way interaction of interest (Domain x Threat Position x Probe Position x Group) was non-significant ($F(1, 48) = .164$; $p = .687$, $\eta^2 = .003$).

ABIs were calculated for the "Highest" and "Lowest" domains, calculated from participants' responses on the word rating task, as before. In the Verbal group, skewness and kurtosis exceeded |2| in the highest worry domain and kurtosis exceeded |2| in the lowest worry domain. There were also three extreme outliers in Verbal group. Therefore, two Mann-Whitney's U tests were conducted, each of which had equal sample sizes ($n = 25$

for both groups). These tests showed no significant differences between the groups either in RTs to words in the Highest domain (Z = -.951, p = .342) or the Lowest domain (Z = -.815, p = .415).

In order to explore whether the two groups differed in the number of highly relevant words that they had identified on the worry rating task, the number of words rated by each participant as highly relevant was extracted. The distribution of the Verbal group contained an extreme outlier and therefore the groups were compared using a Mann-Whitney's U Test, which showed no significant difference between the groups on the mean number of words rated by participants as highly relevant to their worry (Z = -.476, p = .634).

3.4.2 Worry domains questionnaire.

An additional method for assessing the effect of relevance was to derive Highest/Lowest worry domains from participants' responses on the WDQ, which again was achieved by adding up all the items within each domain. The presence of two or more highest/lowest domains was handled in the same fashion as in the previous section.

A four-way ANOVA was conducted (Relevance x Threat Position x Probe Position x Group). Some kurtosis and skewness values exceeded |2| and the homogeneity of variance assumption was not met. These were not resolved following a logarithmic transformation, and therefore a reciprocal (1/x) transformation was conducted, after which skewness and kurtosis values were all within |2| and variances were homogeneous. Sample sizes were unequal: (Verbal n = 22; Imagery n = 23). The four-way interaction of interest (Relevance x Threat Position x Probe Position x Group) was non-significant (F(1, 48) = 1.184; p = .282, η^2 = .024).

The ABI was also calculated for Highest/Lowest worry domains from participants' responses on the WDQ. There were three conditions in which kurtosis exceeded |2|, two in the Verbal group and one in the Imagery group. There were also three extreme outliers in the Verbal group. Therefore, two Mann-Whitney's U Test was performed to compare the groups. The two groups did not differ from each other: Highest (Z = -.039, p = .969); Lowest (Z = -.427, p = .669).

3.5 Subsidiary Analyses of the Dot Probe Task

3.5.1 Engage and disengage components of attention.

Koster, Crombez, Verschuere and Houwer (2004) adapted the dot probe task to allow for a decomposition of engage and disengage components of attention, as a positive ABI score can only indicate attentional bias for threat but not whether this constitutes a bias of the engage or disengage components of attention. This was achieved by adding Neutral-Neutral trials that are always probed, i.e., trials in which there is not a threat word but both words are neutral in valence. This provided a baseline measure of RTs to visual stimuli. By comparing the baseline RTs on Neutral-Neutral trials to probes replacing either threat words or neutral words on Threat-Neutral trials, the dot probe allowed for the engage and disengage components of attention to be investigated.

Salemink et al. (2007) provided two equations to represent the calculations proposed by Koster et al. (2004). Salemink et al. originally named these Orienting Index and Disengaging Index, but in the current study these will be known as Engage Index and Disengage Index, respectively:

Engage Index: dN,N – dT,N

Disengage Index: dN,T – dN,N

where dN,N = Neutral-Neutral trial; dT,N = Threat-Neutral trials on which the probe replaces the threat word; dN,T = Threat-Neutral trials on which the probe replaces the neutral word.

Two independent samples *t*-tests were conducted to compare the Engage and Disengage Indices of both groups. Levene's test for equality of variances was significant in both cases and therefore statistical corrections were made for unequal variances. No significant difference was found between the Engage Index of the Verbal and Imagery groups ($t(38.718) = .634$, $p = .530$), nor between the Disengage Index of the two groups ($t(39.338) = -.790$, $p = .434$). To test whether the Engage and Disengage Indices of the two groups differed from 0, two one-sample *t*-tests were carried out. For the Verbal group, the Engage Index did not differ significantly from 0 ($t(24) = .239$, $p = .813$), nor did the Disengage Index ($t(24) = -.218$, $p = .829$). For the Imagery group, the Engage Index did not differ significantly from 0 ($t(24) = .239$, $p = .813$), nor did the Disengage Index ($t(24) = 1.171$, $p = .253$).

3.5.2 Vigilance.

In order to determine the presence of a general vigilance effect, as indicated by the results of Oathes et al. (2010; see Section 1.14) a 2 x 2 x 2 ANOVA was conducted (Probe Position x Trial Type x Group), with equal sample sizes ($n = 25$ for both groups). One extreme outlier was found in the Imagery group. There was a main effect of Probe Position ($F(1, 48) = 105.102$, $p < .001$, $\eta^2 = .686$) but Trial Type showed a non-significant trend ($F(1, 48) = 3.102$, $p = .085$, $\eta^2 = .061$), in which responses were slower on Threat-Neutral

trials than Neutral-Neutral trials (see Table 8). There was no significant Trial Type x Group interaction ($F(1, 48) = 1.851$, $p = .180$, $\eta^2 = .037$). No three-way interaction was found of Probe Position x Trial Type x Group ($F(1, 48) = 1.162$, $p = .286$, $\eta^2 = .024$), somewhat contrary to what had been found by Oathes et al.

Table 8. Mean RTs by Trial Type.

Trial Type	Mean [Standard Error of the Mean]
Threat-Neutral	515.935 [8.228]
Neutral-Neutral	512.990 [8.152]

3.6 Hypothesis Three: The Verbal Group Will Show a Significantly Higher Frequency of Negative Intrusions Following the Breathing Focus Task than the Imagery Group

The numbers of negative intrusions in both groups were statistically compared. Two independent raters were trained to rate the expanded descriptions provided by 11 participants following the breathing focus task. A kappa value of .882 was calculated for inter-rater reliability, which is within the outstanding range of correlation, according to Landis and Koch (1997). One rater then proceeded to rate the expanded descriptions of the remaining 31 participants. A two-way ANOVA was then conducted with a between-subjects factor of Group (Verbal; Imagery) and a within-subjects factor of Rater (Self; Independent). There was a main effect of Rater ($F(1, 40) = 9.536$, $p = .004$, $\eta^2 = .193$), in which participants rated significantly more intrusions as being negative than the independent rater (see Table 9). There was no main effect of Group ($F(1, 40) = 2.881$, $p = .097$, $\eta^2 = .067$) and no significant interaction effect between Rater and Group ($F(1, 40) = .022$, $p = .884$, $\eta^2 = .001$).

Table 9. Mean number of negative intrusions as rated by participants and independent raters, by Group.

	Group	Mean Negative Intrusions [SD]
Independent rating	Verbal [*n* = 20]	2.0500 [1.3945]
	Imagery [*n* = 22]	1.3636 [1.3290]
Self rating	Verbal [*n* = 20]	2.6000 [1.6026]
	Imagery [*n* = 22]	1.8636 [1.5211]

3.7 Correlating the Two Experimental Tasks

The ABI scores derived from the 3-way ANOVA (see Section 3.3.2) were entered into a Pearson's product-moment correlation with participants' negative intrusions on the breathing focus task, separately for the two groups. No significant correlation was found between these measures in either group (see Table 10).

Table 10. Correlations between ABI on the dot probe task and number of negative intrusions on the breathing focus task, by Group.

Group	Mean ABI [SD]	Mean negative intrusions on breathing focus	Pearson's correlation (*r*)	Significance
Verbal [*n* = 20]	5.1375 [17.3493]	2.60 [1.6026]	-2.17	*p* = .358
Imagery [*n* = 22]	-4.4773 [12.7246] Bottom	1.8636 [1.5211]	-.233	*p* = .297

Chapter 4

Discussion

4.1 Overview of Chapter

This chapter begins with a summary of the current study's methodology before summarising the main experimental findings. The limitations of the current study are then discussed before possible interpretations are advanced for the results that were obtained. Findings are also related to those of previous studies. The theoretical implications of the current results are then proposed, along with an integrative theory that combines the proposed interpretations of these findings with the processes laid out in established models of worry. Finally, the clinical implications of the current study are discussed along with possible future lines of enquiry.

4.2 Summary of the Current Study

This study investigated whether the way in which people tend to worry (i.e., in a predominantly verbal way) might maintain the worry process via the generation of attentional bias for threat. The dot probe task was used, which had previously revealed attentional bias for threat in clinical anxiety and depression. The study also attempted to replicate a recent study which had shown that different ways of worrying (verbal and imagery-based) give rise to significant differences in negative thought content during a breathing focus task.

All participants in the study were classified as high worriers based on PSWQ scores. In the first part of the experiment, participants underwent training to worry in either a predominantly verbal or imagery-based way before they worried about a specific worry of

theirs in their designated thinking style. Following this first worry phase, participants undertook the dot probe task (split into two halves, with a brief middle worry phase in-between to re-activate worry for the second half of the dot probe task), and then a word rating task. In the second part of the experiment, participants worried about a second worry of theirs in their designated thinking style before undertaking the breathing focus task. Mood Rating Scales were administered repeatedly throughout the study in order to assess state mood at various points and Manipulation Check Scales were completed for each worry phase.

4.3 Overview of Findings

Consistent with hypothesis one, it was found that the Verbal group showed an attentional bias for threat on the dot probe task whereas the Imagery group did not, as demonstrated by a congruency effect, revealed by a significant three-way Threat Position x Probe Position x Group interaction. This difference could not be explained by variation in state mood following the first worry phase. However, an alternative measure of attentional bias (the Attentional Bias Index; ABI) did not reveal any attentional bias in either group, which was not consistent with hypothesis one.

Contrary to the second hypothesis, the personal relevance of threat words on the dot probe task to what participants had worried about during the first and middle worry phases did not moderate the aforementioned three-way interaction. Furthermore, the two groups were found not to differ on the mean number of words on the word rating task that participants had selected as highly relevant to their worries, indicating that the number of different topics that the two groups had worried about during the first and middle worry phases did not differ.

A subsidiary analysis did not show significant attentional bias resulting either from enhanced engaging to threat or impaired disengaging from threat. Another subsidiary analysis found no evidence for worry giving rise to vigilance to all stimuli in the presence of threat, as had been indicated by a previous study.

Contrary to hypothesis three, no differences were found between the two groups on the number of negative intrusions on the breathing focus task following the second worry phase.

In summary, the main hypothesis was supported: Verbal worry leads to significantly more attentional bias for threat than imagery-based worry, on one measure of attentional bias. Furthermore, this effect cannot be explained by differences in state mood following the two types of worry.

4.4 Methodological Limitations

The limitations of the current study will now be outlined, followed by a more in-depth discussion of the possible interpretations of the results.

4.4.1 Participant characteristics.

The participants included in the current study were high-worriers and there was no requirement of clinical GAD, although some participants might have met diagnostic criteria. Further study with clinical participants would be required in order to conclude with some confidence that the results of the current study are also applicable to clinical samples.

Participants were not assessed on current depression other than on the Mood Rating Scales. Depression can mask anxiety-related attentional bias (e.g., Bradley et al., 1995);

therefore, it would have been more experimentally rigorous to rule out any differential effect that depression could have had on attentional bias across the two groups with a questionnaire to assess levels of clinical depression, such as the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961). This is unlikely to have been an issue in the current study, however, as participants were randomised into experimental groups.

4.4.2 Dot probe task.

For this study, the dot probe task was chosen as it allowed for the possibility of more fine-tuned analyses of attentional bias (e.g., Engaging and Disengaging Indices) than many other paradigms. However, it cannot be ignored that the dot probe task has not traditionally been a robust measure of content-specific attentional bias (Mogg et al., 1989), and was therefore not the best paradigm for looking at how attentional bias is influenced by the relevance of words on the dot probe task to what participants had worried about during the first and middle worry phases. The modified Stroop task has more consistently revealed these effects (Mogg et al.), and future studies interested in investigating this issue might benefit from using this task instead.

4.4.3 Word stimuli.

The argument of Bradley et al. (1997), that pictorial stimuli are more ecologically relevant than word stimuli, speaks to the limited conclusions that can be drawn from the current study's results regarding attentional bias for everyday threat following verbal worry. The rationale for choosing word stimuli on the dot probe task instead of more ecological, pictorial stimuli was to better tap certain domains of concern. Hence, the choice

of word stimuli represented a favouring of stimulus breadth over both ecological validity and threat intensity (as ecological stimuli are known to be more reliably associated with attentional bias, see Yiend, 2010). It would be valuable for future studies to investigate the properties of attentional bias for more ecological stimuli following different worry inductions, although this would necessarily involve limiting the studies' ability to investigate "content-specificity" of attentional bias, as argued by Mogg and Bradley (1999).

Despite the intention to represent a breadth of worry domains, many of the words used in the dot probe task belonged semantically to more than one worry domain. For instance, there was much overlap between words in the Relationship domain and those in the Social domain ("shunned" being one example of a word that could belong to both). A related issue is that, by not including neutral words in the word rating task, the analyses of the effect of word relevance to participants' worries on attentional bias for threat were limited; although these words were deemed neutral by the experimenter, participants could have subjectively appraised some "neutral" words as threatening. Should the study be repeated, all words appearing on the dot probe task should be included in the word rating task, whether considered neutral or threatening by the experimenter.

A weaknessof the current study was that Mood Rating Scales were not administered immediately prior to the word rating task. This would have permitted an analysis as to whether the two groups differed in their state anxiety immediately prior to the word rating task, which could help ascertain whether ratings of word relevance were likely to be differentially biased by state mood. Furthermore, when doing the word rating task, worry might have dissipated to the extent that participants were less able to access the relevance of words to their own worries. Although adding an additional worry phase would have been

excessive in the current study, the case could be made for future studies looking to replicate the findings of the first part of the current study to include a brief worry phase, such as 2 minutes, to re-activate worry immediately prior to the word rating task.

4.4.4 Worry training and worry phases.

The worry training phase occurred prior to the identification of participants' worries. It is possible that participants from the two groups identified different sorts of worry as a result of different training procedures, e.g., worries that were more concrete in nature following the imagery worry induction. It would perhaps be better for future studies to ask participants to identify two worries prior to entering the worry training phase, in order to remove this potential biasing effect. This would also allow for easier stratified randomisation of participants to either the Verbal or Imagery group should a difference arise between the two groups by chance in terms of the distress and personal relevance attached to their identified worries.

The worry that was induced in the experiment is likely not to exactly mirror more ecologically occurring worry. The mere fact that it was induced as opposed to spontaneous is one difference. Furthermore, giving participants express permission to worry might reduce the degree to which it is aversive, as the responsibility for any negative outcomes (cf. Wells' Type II meta-beliefs, 1995) might be seen as shared with the experimenter. Despite this shortcoming, only worries that were highly personally relevant to participants were selected

Perhaps more importantly, however, the instruction to participants in both groups to worry about a specific concern might have encouraged participants to keep the worry more

circumscribed and, in this sense, more domain-specific, which could have accounted for the same mean number of words across the groups that participants rated as highly relevant to what they had worried about during the first and middle worry phases. We might have expected the Verbal group to endorse a broader range of threat words as relevant to their worry topics, on the basis that verbal worry can be conceptualised as less concrete (Butler, 1994).

4.4.5 Assessment of thinking style.

Although this study was able to analyse the breadth of worry domains that the two groups worried about during the first and middle worry phases by comparing the mean number words on the worry rating task that the two groups rated as highly relevant to what they had worried about, what was not assessed was differential concreteness of the worry process during the worry phases. It is likely that the groups differed significantly on the concreteness of their worries during the worry phases, in which the Verbal group experienced more abstract worry than the Imagery group, characterised by vagueness, as has found to be the case in typical pathological, predominantly verbal worry (Butler, 1994). Indeed, the verbal worry phases involved merely instructing participants to think in words, sentences and questions about their worry with no instruction with regard to worrying about specific outcomes, whereas the imagery worry phases involved priming participants' specific feared outcomes as well as encouraging participants to situate their mental images in space and time and to experience the worry "as thought it were happening now". Concreteness is an important concept as it relates to Stöber's reduced concreteness theory of worry (1998), in which the abstractness of the worry process leads to the generation of vague images, which leads to a reduction of physiological reactivity that serves to maintain

the abstract worry process by negative reinforcement. However, without measuring concreteness of thought, it is not possible to know whether the two groups differed in this respect.

Should similar studies be conducted in future, it would be beneficial to include questionnaires that would allow for a group comparison on concreteness of thinking during worry phases, in order to help determine whether concreteness partially mediates the effect of different worry inductions on attentional bias. For the Verbal group, this might have been achieved by asking participants to rate on a VAS the extent to which they were worrying about outcomes that were specific (from "extremely vague" to "extremely specific"). For the Imagery group, concreteness of imagery could also have been assessed by means of a similar VAS, by asking participants to rate the quality of their mental images during the worry phases (from "extremely vague" to "extremely vivid"), with the rationale that vividness of imagery is an analogue for concreteness of processing as it would be unlikely that participants could generate a vivid image about a vague outcome.

4.5 Interpretation of Findings

4.5.1 Hypothesis one.

The fact that a three-way interaction effect of Threat Position x Probe Position x Group was found, in which a two-way interaction effect between Threat Position and Probe Position was confined to the Verbal group, provides support for the primary hypothesis of the study, i.e., that verbal worry leads to a stronger attentional bias for threat than imagery-based worry. The nature of this two-way interaction in the Verbal group was that Threat Position moderated the main effect of Probe Position, in which the degree to which RTs to

probes which appeared in the top location were speeded was lessened when the threat word appeared in the Bottom (incongruent) position than when it appeared in the Top (congruent) position. The main effect of Probe Position that was found in the current study was also found following the worry induction of Oathes et al. (2010), and has also been found in studies of anxiety-induced attentional bias (e.g., Mogg & Bradley, 1999; Keogh, Dillon, Georgiou & Hunt, 2001). According to Cohen (1988), effect size (η^2) can be categorised as small (0.01), medium (0.059) and large (0.138). The effect size of the three-way interaction obtained in this study ($\eta^2 = 0.097$) is therefore in the medium range. ABI analyses clarified this 3-way interaction effect: The Verbal group showed significantly faster RTs to threat vs neutral words compared to a baseline of 0, whereas the Imagery group did not. Furthermore, there was found to be significantly more speeding of RTs to threat words in the Verbal group than in the Imagery group.

In order to explore a possible reason for the three-way interaction found in the current study, an analysis was conducted comparing each group's anxiety, depression and happiness scores on the Mood Rating Scales administered after the first worry phase. There were no differences between the groups on either of these measures following the first worry phase, which indicates that the differential effect of Threat Position on Probe Position by Group on the dot probe task did not arise due to different effects of verbal and imagery-based worry induction on participants' state mood.

One might argue that the results of the current study did not reflect a true attentional bias for threat, but that, similarly to the argument of Bradley et al. (1997) (see Section 1.11.2), verbal worry merely primed certain words and facilitated RTs to those same words, rather than generating an attentional bias for threat resulting from a more general priming

of all threat-related mental representations; however, the lack of a Relevance x Group interaction does not support this, as one would expect the words to be deemed highly relevant to one's worry to be the more likely to be primed and therefore to show a greater speeding of RTs in the Verbal group than the Imagery group. To further investigate this possibility, researchers might repeat this study by using pictorial stimuli, which would remove the likelihood of verbal worry priming specific words.

4.5.2 Hypothesis two.

The analysis of personal relevance of words on the dot probe task to what participants worried about during the first worry phase provided further information as to the nature of the three-way interaction effect. Relevance was added as a third within-subjects factor in the ANOVA and no significant four-way Relevance x Threat Position x Probe Position x Group interaction was obtained. This four-way interaction was non-significant for each of the three ways in which it was performed, twice for measures of relevance based on participants' ratings on the word rating task and once for a measure of relevance based on participants' responses on the WDQ. This lack of a four-way interaction is contrary to hypothesis two, which would predict a significant four-way interaction in which Relevance moderates the significant three-way interaction (Threat Position x Probe Position x Group interaction). However, the lack of a significant four-way interaction suggests that not only does attentional bias operate toward general threat (i.e., independently of the relatedness of threat-words to worry content), but that imagery-based worry does not give rise to attentional bias even toward threat-words that are highly related to worry content. What mechanism could give rise to a relatively indiscriminate bias for

threat after verbal worry, and how might imagery-based worry be protective against any attentional bias for threat?

The model of Holmes and Mathews (2010), in which imagery-based processing entails some overlap with actual perception of events, allows for imaginal exposure to take place. Can the attentional bias differences between the groups of the current study be explained by different levels of imaginal exposure? It is possible that a habituation process took place during imagery-based worry in the Imagery group, which somehow gave rise to less of an attentional bias than the Verbal group, in which the cognitive avoidance provided by verbal worry (according to the cognitive avoidance hypothesis of Borkovec et al., 2004) impaired the exposure process to relevant words. Indeed, exposure therapy has been known to reduce attentional bias for threat (e.g., Watts, Trezise & Sharrock, 1986; Lavy, van den Hout & Arntz, 1993). However, the analyses showed no significant difference in the two groups' anxiety following the first worry phase, which is not in keeping with the idea of more habituation having taken place in the Imagery group, as one would expect a concomitant reduction in anxiety if this had been the case.

Holmes and Mathews (2010) speculated on additional mechanisms via which imagery might be beneficial over verbal processing. One possibility mentioned by these authors is that the individual exposed to imagery might come to appreciate the difference between imagery and immediate, real-world perceived stimuli. While this could have been the case in the current study, it is doubtful that a 6 minute exposure period would be sufficient to instill this realisation in those who were in the Imagery group. Furthermore, the lack of a difference in anxiety between the groups is not suggestive of such a process having taken place to any great extent in the Imagery group. These authors also suggested

that image rescripting could be a mechanism via which imagery-based processing could be beneficial. In the current study, it is possible that training some participants to imagine their worries could encourage this process to occur naturally, in which staying with an image naturally allows more room for benign imagery, e.g., of a less severe outcome; however, again the lack of difference in anxiety levels of the two groups does not suggest that those in the Imagery group were significantly more likely to happen upon a more benign outcome for their worry topics during the first worry phase.

Goldman, Dugas, Sexton and Gervais (2007) noted that imaginal exposure might derive effectiveness both by addressing cognitive avoidance (i.e., encouraging habituation to take place) as well as by tackling intolerance of uncertainty through the generation of mental images that are concrete and engender more of a sense of certainty. However, while imagery-based worry might give rise to a higher sense of certainty than verbal worry, it is difficult to think of a plausible mechanism via which levels of uncertainty might affect attentional bias for threat.

The theory of Hirsch and Mathews (submitted) mentioned in the introduction, i.e., of verbal worry engendering a general threat-detection mechanism, seems a better explanation of the findings of the current study. According to this theory, by worrying in a predominantly verbal way, the Verbal group triggered a "general threat detection mechanism". This hypothesis explains the three-way interaction obtained in the study as well as the fact that the groups did not differ on state anxiety. It is also consistent with the fact that this three-way interaction was not moderated by the relevance of words on the dot probe task to participants' particular worries (i.e., the lack of a four-way interaction effect,

see Section 4.5.2). If this "general threat detection" mechanism was activated in the Verbal group, what triggered it?

One trigger might have been a group difference in the number of topics worried about during the first worry phase. One might expect the Verbal group to have jumped more from topic to topic, covering a wide range of worry domains, as this is what is observed in pathological worriers (Butler, 1994). Worrying purely in images is not commonplace (Borkovec & Inz, 1990), hence it is unlikely that participants in the Imagery group will have been as able to jump from topic to topic. It is possible, then, that the Verbal group activated many different worry domains by moving in-between worry topics and, in doing so, activated an attentional bias more generally to words covering multiple domains of worry. However, this seems unlikely given that the two groups did not differ on the mean number of words they deemed highly relevant to what they had worried about in the first and middle worry phases. What this suggests, on the contrary, is that participants in both groups thought about an equal spread of topics during the first worry phase. It would be interesting for future studies to experimentally manipulate the spread of worry topics that participants worry about, by randomising participants into two groups: One that is instructed to worry about one specific topic during the worry phase and one that is instructed to jump from topic to topic. The two groups could then be compared on attentional bias for threat, to see whether worrying about many topics over many worry domains generates more of an attentional bias for threat than worrying about a single topic within a single worry domain.

Another possibility is that, as discussed in Section 4.4.5, the groups differed significantly on the concreteness of their worries during the worry phases. It would be

expected for the Verbal group to have experienced more abstract worry (Butler, 1994), characterised by worrying about vague outcomes. Some of the downsides of abstract verbal processing have already been discussed by other theorists. For example, Stöber's reduced concreteness theory of worry (1998) proposed that it is the inherent vagueness of verbal worry that imbues it with its physiologically-dampening effect (e.g., Borkovec & Hu, 1990), leading to the reinforcement of the worry process. Watkins (2008) discussed the emotional costs of repetitive thinking characterised by processes such as worry. In light of the results of the current study, it is proposed that the vague, abstract nature of verbal worry might additionally trigger the "general threat detection mechanism" of Hirsch and Mathews (submitted). The possibility that worrying could influence the attentional system is in line with the combined cognitive bias hypothesis of Hirsch et al. (2006), in which a bias in one cognitive domain can trigger a bias in the same direction in another domain of processing. In the current study, it is possible that a bias for abstract (verbal) thought triggers a bias in attention that is also abstract (i.e., not specific to any one type of threatening stimulus). This could be tested in more detail in future studies by looking more closely at the properties of verbal worry that give rise to attentional bias, by inducing verbal and imagery-based worry in both a concrete and abstract form (cf. Watkins & Moulds, 2005, who experimentally induced concrete/abstract ruminative self-focus and found concrete self-focus of a verbal nature to improve social problem solving in depressed patients relative to abstract self-focus).

4.5.3 Subsidiary analyses.

There was no main effect of Trial Type, no Trial Type x Group interaction and no three-way Probe Position x Trial Type x Group interaction, contrary to what had been

found by Oathes et al. (2010). Hence, the current study does not support the notion of verbal worry giving rise to a general vigilance effect. However, this could be due to many differences between the current study and that of Oathes et al. (see Section 4.6.1). There was not found to be any significant effect of engaging/disengaging as a result of Verbal worry in an analysis of ABI scores, which is perhaps surprising given the evidence for attentional bias for threat in the Verbal group in the three-way interaction effect and the subsequent ABI analysis (see Sections 3.3.1 and 3.3.2). However, this could be an artefact of using different methods for calculating ABI scores (see Footnote 4).

4.5.4 Hypothesis three.

The breathing focus task did not reveal any differential effect of worrying in a verbal or imagery-based way on negative thought intrusions, either on the self-rated or independently-rated analyses. This is contrary to the findings of Stokes and Hirsch (2010). Therefore, the results of this study did not support hypothesis three. Furthermore, there was not found to be a correlation between the number of negative intrusions (which the current study considers to be a measure of attentional bias for threat) on the breathing focus task and attentional bias for threat on the dot probe task, which might be taken to indicate that, although attentional bias for threat was evident in the Verbal group on the dot probe task (see Section 3.3.1), attentional bias as measured by the breathing focus task was not evident. Nonetheless, it is possible that the lack of a significant finding on the breathing focus task is an artefact of the study's methodology rather than being indicative of a lack of a real difference between the effects of verbal and imagery-based worry on the breathing focus task.

The breathing focus task was near the very end of the study, by which point most participants were noticeably fatigued, and many reported that this was the case. Indeed, "tired" was a common thought intrusion to occur in the breathing focus task. Secondly, there was no re-training process before participants entered the second worry phase, which might have led to fewer differences between the groups on thinking style during this worry phase. To support this interpretation, the Verbal group was found to be significantly less adherent to worrying in a verbal way in the last 2 minutes of the second worry phase (before the breathing focus task) compared with the last 2 minutes of the first worry phase (before the dot probe task). Thirdly, analyses indicated that the Imagery group experienced significantly less anxiety during the second worry phase, which immediately preceded the breathing focus task, than the first worry phase, which might have been due to fatigue. Finally, a lack of a pre/post comparison on the breathing focus task reduces the sensitivity of the task as it relied fully on between-subject effects rather than the additional factor of within-subject change. In this study it was a warranted design as it was done to reduce the length of the study and fatigue effects; however, future studies attempting to replicate Stokes and Hirsch's (2010) study should ideally adhere more closely to these authors' original methodology.

4.6 Theoretical Implications

The results of the current study are supportive of the notion of a "general threat detection mechanism" (Hirsch & Mathews, submitted), in which worry in its common, predominantly verbal, form generates an attentional bias for all sorts of threat stimuli. It seems likely that this attentional bias would increase the density of stimuli in the person's environment that could trigger a worry episode.

The attentional bias in the current study was found to occur at 200 ms, an SOA which is within the "initial orienting" period of attentional allocation, according to Mogg and Bradley (2006), which is analogous to an earlier, more automatic stage of attentional processing (although there is no consensus as yet regarding specific SOAs at which "automatic" becomes "strategic"). This is in keeping with dot probe tasks that have previously demonstrated similar attentional biases at similar SOAs in clinical anxiety, as demonstrated initially by MacLeod et al. (1986). To link these results in with the model of Williams et al. (1988, 1997), negative and abstract verbal thought gives rise to attentional bias for threat at the "priming" stage.

The relative automaticity of this process is likely to make it harder to control; even if attentional bias for threat could be consciously overridden, as proposed by the model of Mathews and Mackintosh (1998), its insidious nature would make it difficult to recognise its operation in the first place. It is possible that there is a link between the fact that worry-induced attentional bias in high-worriers happens at a stage in processing that would make it difficult to control, and the results of Ruscio and Borkovec (2004) showing that worry is perceived as less controllable with increasing degrees of worry severity (i.e., from non-anxious controls, to non-GAD high worriers, to people with GAD). For example, it might be that degree of controllability of attentional bias following verbal worry somehow leads to differences in perceived worry controllability.

4.6.1 The approach-avoidance theory of GAD.

The approach-avoidance theory of GAD is found in Figure 5, which is a combination of the cognitive avoidance hypothesis (Borkovec et al., 2004) with the speculated account of the current study's findings. This integrative theory is found within

the dotted box, along with a proposed mechanism via which attentional bias leads to aversive mental imagery ("4. Bottom-up triggering" – cf. the model of Holmes & Mathews, 2010). Processes represented by the models of Wells (1995) and Dugas et al. (1998) are found outside the dotted box, and the theory proposes that the relatively uncontrollable aversive mental imagery resulting partially from an automatic attentional bias contributes to meta-beliefs about the uncontrollability of worry.

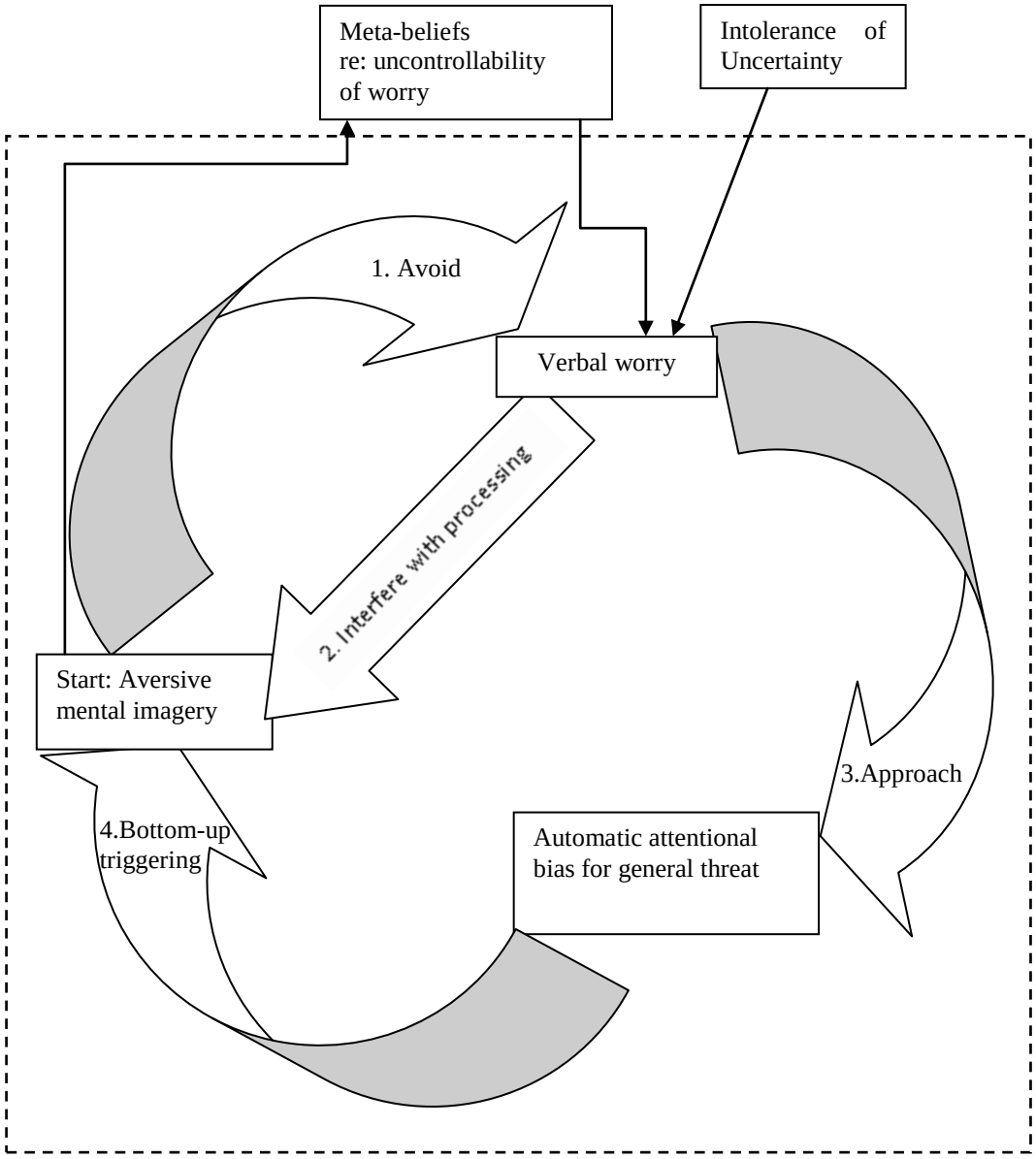
This integrative theory posits the operation of two interactive cognitive mechanisms in the maintenance of worry in GAD: One being cognitive avoidance, the other being cognitive approach. First let us consider the cognitive avoidance function.

The vicious cycle presented in Figure 5 can be said to begin at the box labelled "Start: Aversive mental imagery", which represents the aversive mental imagery that is key in the cognitive avoidance hypothesis of Borkovec et al. (2004). According to Borkovec et al., mental imagery then leads to verbal worry, which functions to suppress (i.e., cognitively avoid) this mental imagery (represented by the arrow labelled "1. Avoid" leading to the box labelled "Verbal worry"). What results is an interference with the processing of the aversive mental imagery (the "fear structures"; Foa and Kozak, 1986) that began the cycle, which maintains the imagery. This is represented by the arrow labelled "2. Interfere with processing" leading back into the first box: "Start: Aversive mental imagery".

What is additionally proposed in the approach-avoidance theory, based on speculative interpretations of the current study's results, is the operation of a secondary cognitive approach function, in which a "general threat detection mechanism" is triggered by predominantly verbal worry (arrow "3. Approach"), which then leads to a higher

instance of bottom-up triggering of imagery (arrow 4. “Bottom-up triggering”) as a wider range of more threatening-stimuli come to be noticed in the environment. This “bottom-up triggering” is based on Holmes and Mathews’ (2010) model, which proposes that sensory cues lead to the generation of emotional images via the accessing of memory stores. In the proposed approach-avoidance theory of GAD, the very mental images that verbal worry functions to suppress are contained within autobiographical and semantic memory stores, in the way that Foa and Kozak (1986) originally proposed their “fear structures” to be memory-based representations. Once these “fear structures” are activated, verbal imagery is then recruited to suppress the imagery and its associated affect, thereby completing the cycle. It would also be expected that verbal material would be activated along with mental imagery, but this theory focuses on imagery as it is central to the cognitive avoidance hypothesis of Borkovec et al. (2004).

Figure 5. The approach-avoidance theory of GAD.



While the current study provides support for the "3. Approach" arrow of Figure 5, it only does so for high-worriers who are not necessarily clinically impaired by worry. In Figure 5, attentional bias leads directly to aversive imagery via "3. Bottom-up triggering". Whether attentional bias for threat does trigger aversive mental imagery could be tested in future studies by inducing attentional bias for threat (cf. the study of Krebs, Hirsch &

Mathews, 2010), with participants keeping a diary of aversive mental imagery in the time period immediately following the attentional bias induction (e.g., for one hour), and then comparing these participants with those who receive a benign attentional bias induction.

That the study of Oathes et al. (2010) did not find worrying to give rise to a Threat Position x Probe Position interaction merits some consideration. First of all, in their study, participants were not trained to worry in a particular way and could therefore have been experiencing more mental imagery than participants in the Verbal group of the current study. Secondly, these authors recruited participants scoring in the "low normal range" on the PSWQ, and it could be that attentional bias differentially affects low- and high-worriers, much in the way that working memory is differentially depleted during worry in low- and high-worriers (Hayes, Hirsch & Mathews, 2008). A replication of the first half of the current study with low worriers could help to clarify whether more pure verbal worry generates attentional bias for threat irrespective of worry status, or whether attentional bias is only triggered in high-worriers. This replication could also help clarify whether different SOAs can account for the different findings of the current study and that of Oathes et al., as it might be that attentional bias might have been operating at a more "automatic" stage of attention, which might not be detected at the SOA of 500 ms used by these authors.

4.7 Clinical Implications and Future Avenues for Research

While it would be premature to make clinical recommendations on the basis of results of the current study, which did not specifically recruit a clinical population, the absence of attentional bias in imagery-based worry is in support of the use of imagery-based techniques in therapy. CBT is the first-line treatment for GAD (National Institute for Health and Clinical Excellence; NICE, 2004) and numerous CBT treatment protocols

recommend the inclusion of imagery exposure. For example, Borkovec et al. (2004) recommend the inclusion of imagery exposure in the treatment of GAD.

What cannot be recommended is the type of imagery that might be most helpful. As mentioned in Section 4.4.5, the crucial properties of the imagery-based worry that protected participants in the current study from attentional bias for threat are not known, and future possible lines of enquiry were suggested that would help to pick out what might be the most beneficial aspect of imagery-based processing. In particular, future studies would need to include clinical populations in order to make any firm recommendations about how to apply imagery-based techniques in therapy.

The effects of worry on attentional bias across disorders would be interesting to investigate, as research has suggested that worry is a transdiagnostic process that concerns disorder-specific material (e.g., Ehring & Watkins, 2008). Conceptualising worry more broadly under the rubric of "repetitive negative thinking" (Watkins, 2008) allows us to consider the possibility that attentional bias might result from other types of verbal, abstract processes, such as rumination and obsession.

Much like previous research has looked at how biases in one cognitive domain can produce congruent biases in other domains (e.g., Hertel et al., 2003), there are many interesting avenues remaining to be explored. The link between attentional bias and working memory capacity is one, as it is possible that the generation of attentional bias might be partially responsible for depleted working memory during worry (e.g., Hayes, Hirsch & Mathews, 2008).

While the current study did provide some support for attentional bias for threat in worry, the components of attention that were affected could not be determined. Future studies might clarify this, which would help to fine-tune theories of worry-induced attentional bias.

4.8 Summary

There have been many theories to account for the maintenance of worry in GAD. The current study explored the possibility that verbal worry might engender more of an attentional bias for threat than imagery-based worry, and provided support for this. Furthermore, the finding of attentional bias for threat following verbal but not imagery-based worry could not be accounted for by state mood differences between the two experimental groups. It is proposed that verbal worry generates a "general threat detection mechanism" (Hirsch & Mathews, submitted), which maintains the worry process by increasing the number of threatening stimuli that are noticed in one's environment,thereby triggering aversive mental imagery, which is unhelpfully dealt with in turn by verbal worry, as per the cognitive avoidance hypothesis (Borkovec et al., 2004). Although the results do not warrant any strong conclusions regarding the existence of attentional bias following worry in clinical samples, they support of the use of imagery-based techniques in therapy. It would be valuable if the methodology of the first part of the current study were to be repeated with a clinical sample.

Some future lines of investigation are proposed in order to clarify the important aspects of verbal worry that might generate the attentional bias found in the current study, such as experimentally manipulating levels of concreteness of worry. It is also proposed that worry-induced attentional bias could be investigated transdiagnostically, that the

interaction between worry-induced attentional bias and working memory might be explored and that the components of attention affected by worry-induced worry should be investigated.

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Appendix 1

Information Sheet

PNM/10/11-71

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

What is the link between attention and worry?

We would like to invite you to participate in this postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The principal aim of this research is to explore the link between how people worry and how this affects their attention to threatening information in the environment. A better understanding of this will inform the treatment of generalised anxiety disorder (GAD). The primary feature of GAD is uncontrollable worry.

This study will recruit students studying at King's College London, College staff and members of the public, who are determined by a screening questionnaire to be suitable (see next paragraph). Participants will only be included if they speak English as a first language.

If you agree to take part after reading this information sheet, you will be asked to complete and return the Penn State Worry Questionnaire. If you meet our criteria you will be asked to take part in the study. If you agree to take part, we will invite you to attend an experimental session within 2 weeks. This session will last approximately 1 ¾ hours, although please be advised that it can last up to 2 hours. The session will entail first of all completing 4 more questionnaires, which will ask you about levels of anxiety, depression and worry.

Following these questionnaires, you will then be briefly trained to complete a straightforward computer task which involves responding to symbols appearing on the screen after 2 words. Then you will be trained to worry in a certain way, and will be asked to identify 2 current worries of yours (that you feel comfortable sharing with the researcher), before going on to think about one of those worries in the particular way that you were trained, for 6 minutes, with regular breaks in between. After this, you will complete the computer task on which you were trained, before completing another computer task which involves rating some words. Then you will be trained to focus on your breathing in a certain way, before being asked to think about the second worry you identified in the same way as before for 6 minutes, with regular breaks in between. Then you will go on to focus on your breathing for 5 minutes, as practiced. In the task in which

you focus on your breathing you will be asked to report briefly on where your mind wanders to and, later, to elaborate somewhat on the contents of your thoughts.

At the end of the session, you will be debriefed about the study in some more detail, and this will be a chance for you to discuss with the experimenter how you found the experiment.

In terms of risks, the study involves thinking about two current worries of your own. Some people might find this task uncomfortable or mildly distressing, but that feeling will go away once the task stops and will have no long-term impact. Furthermore, although unlikely, the questionnaires relating to your mood and worry may cause slight distress. It is also possible that being presented with words on a computer screen, some of which you might find negative, could be slightly distressing, but again this feeling will go away once the task stops and will have no long-term impact. Finally, it may be slightly distressing to report the contents of the thoughts that may arise during the task in which you focus on your breathing. Any discomfort/distress arising from any of these tasks will be met with empathy and support. If the tasks bring up any concerns, you will have the opportunity to discuss them with the experimenter.

If you'd like to have a written report of the main project please let the main researcher (Marc Williams) know, in which case we can keep your contact details, such as your email address, in a completely separate database from your data so that we can send you the final report. Furthermore, there will be an opportunity for you to discuss any concerns resulting from the experiment with me or another member of the research team if appropriate.

All information will be kept strictly confidential unless any information is disclosed which could seriously affect the welfare of yourself or others, in which case a third party may have to be contacted for legal reasons. You will be given an identification number which will be attached to your data instead of your name. These data will be kept in a secure database on a password protected computer, a locked filing cabinet, or a secure data storage facility, only to be seen by members of the research team.

Information about your age and sex will be kept in a separate database, so that we can report the demographics of our participants as a whole in the final report. These two databases will be kept for 5 years post-publication, in an anonymised form, as this is a requirement of academic psychology journals.

With your consent, parts of the session will be audio-taped for later categorisation by a member of the research team. These digital recordings will be stored securely on a password protected computer for up to 5 years post-publication of the data – again, this is a requirement of academic psychology journals. They will be stored with only your participant number and no other personal identifying information will be attached. In addition, with your consent, anonymised extracts may be used in resulting publications.

It is up to you to decide whether to take part or not. If you do decide to take part you will be given this information sheet to keep and be asked to sign two copies of the consent form, one of which you will keep. You will be reimbursed £15 for time and travel.

If you do decide to take part you are still free to withdraw at any time and without giving a reason. If you withdraw from the study after completing the experimental session but prior to data analysis taking place, please let us know and your data will be removed from our database, and none of it will be analysed.

If this study has harmed you in any way you can contact King's College London using the details below for further advice and information'.

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Appendix 1 contd

Consent Form

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: What is the link between attention and worry?

King's College Research Ethics Committee Ref: PNM/10/11-71

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Please tick or initial

- **I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without my legal rights being affected. Furthermore, I understand that I will only be able to withdraw my data up to the point of data analysis.** ☐
- **I consent to the processing of my personal information for the purposes explained to me. I understand that such information will be handled in accordance with the terms of the Data Protection Act 1998.** ☐
- **I agree to parts of the session being audio-taped and to the anonymised recordings being categorised by 2 members of the research team.** ☐
- **I understand that all my data from the experimental sessions, including audio recordings, will be anonymised and stored securely along with the rest of my anonymised data on a password protected computer, a locked filing cabinet, or a secure data storage facility for up to 5 years post-publication of the data.** ☐
- **I agree to the possible use of anonymous extracts from audio data to be used in publications.** ☐
- **The information I submit will be published as a report and I will be sent a copy if I request this. I understand that confidentiality and anonymity will be maintained and it will not be possible to identify me from any publications.** ☐
- **I consent to a third party being contacted in the event of disclosing any information that could seriously affect the welfare of myself or others.** ☐

Participant's Statement:

I _____

agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Signed **Date**

Investigator's Statement:

I _____

Confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the participant.

Signed **Date**

Appendix 2

Word Pairs for the Dot Probe Practice Task

Cutlery	Cushion
Stool	Towel
Curtain	Cabinet
Lounge	Switch
Radiator	Bookcase

Appendix 3

Word Pairs for the Dot Probe Task (First Half)

Threat	Neutral	Domain
Lonely	Camper	Relationships
Ugly	Jeep	Relationships
Shunned	Oatmeal	Relationships
Breakup	Agility	Relationships
Unloved	Balcony	Relationships
Coward	Advent	Lack of confidence
Criticised	Digestible	Lack of confidence
Wimp	Plug	Lack of confidence
Stupid	Window	Lack of confidence
Insecure	Farmyard	Lack of confidence
Useless	Sunrise	Aimless future
Failure	Overall	Aimless future
Unemployed	Waitresses	Aimless future
Aimless	Carpets	Aimless future
Absentminded	Handkerchief	Aimless future
Late	Navy	Work incompetence
Incapable	Cosmology	Work incompetence
Incompetence	Constituents	Work incompetence
Lazy	Clam	Work incompetence
Deadlines	Motivated	Work incompetence
Neutral	**Neutral**	
Predictable	Affirmative	
Attic	Infer	
Merely	Trowel	
Enamel	Velvet	
Whistle	Plumber	
Harvest	Itemize	
Wool	Face	
Marrow	Polled	
Domesticate	Contemplate	
Token	Peach	
Salon	Stile	
Impersonate	Conditional	
Devote	Alcove	
Antelope	Organize	
Luminous	Generate	
Assembly	Seasonal	
Resemblance	Candlestick	
Crusty	Random	
Porcupine	Plausible	
Castle	Meadow	

Appendix 3 contd

Word Pairs for the Dot Probe Practice Task (Second Half)

Threat	Neutral	Domain
Bankrupt	Midpoint	Financial
Hardship	Profiles	Financial
Debt	Lace	Financial
Poverty	Cordial	Financial
Bills	Twirl	Financial
Starvation	Celebrates	Socio-political
Abuse	Poise	Socio-political
Landfill	Railways	Socio-political
Torture	Bourbon	Socio-political
Cruelty	Neptune	Socio-political
Agony	Dials	Physical
Cancer	Idioms	Physical
Choking	Croquet	Physical
Crippled	Acrobats	Physical
Assault	Airmail	Physical
Worthless	Recalling	Social
Inferior	Proposes	Social
Boring	Spires	Social
Humiliated	Embankment	Social
Despised	Postcard	Social
Neutral	**Neutral**	
Poster	Pillow	
Fragrance	Casserole	
Kite	Peel	
Potato	Melody	
Icicle	Confer	
Windmill	Outhouse	
Parcel	Poodle	
Toddler	Resides	
Bath	Hike	
Insurance	Passenger	
Transport	Cardboard	
Cabinet	Village	
Filming	Service	
Platonic	Diligent	
Marzipan	Property	
Tuneful	Analogy	
Guessing	Pedigree	
Ingrain	Sublime	
Perimeter	Principle	
Anomalous	Furniture	

Appendix 4

Mood Rating Scales

Please indicate your <u>current mood</u> with an x -:

Not at all Anxious _____ ***Extremely Anxious***

Not at all Depressed _____ ***Extremely Depressed***

Not at all Happy _____ ***Extremely Happy***

Appendix 4 contd

Mood Rating Scales (Administered at the End of Each Worry Phase)

1. Please indicate your <u>current mood</u> with an x:-

Not at all Anxious	_____	***Extremely Anxious***
Not at all Depressed	_____	***Extremely Depressed***
Not at all Happy	_____	***Extremely Happy***

2. Please indicate how distressed you are about <u>your worry topic</u>:

0% Not at all distressed **100% Extremely distressed**

……

Appendix 5

Practice Scenario Scales

(1) How much of your mental activity was in Images?

0 Not at all in images **100** In images all the time

……

(2) How much of your mental activity was in words, sentences and questions?

0 Not at all in words, sentences and questions **100** In words, sentences and questions all the time

……

Appendix 6

Scenario Scales

(1) How much of your mental activity was in Images?

0 Not at all in images **100** In images all the time

……

(2) How much of your mental activity was in words, sentences and questions?

0 Not at all in words, sentences and questions **100** In words, sentences and questions all the time

……

Appendix 6 contd

Scenario Scales (Second Page)

(3). What % of the time when you were thinking about that situation were your thoughts/images:-

- **Negative** _____
- **Neutral** _____
- **Positive** _____

= 100%

---

(4). Please rate how often you have worried about a situation like this over the past few weeks (please circle) -:

0	**1**	**2**	**3**	**4**
Not At all	**Almost Never**	**Sometimes**	**Often**	**Very often**

Appendix 7

Worry Rating Scales

Worry 1 …….
…….

1. **Please indicate *(with a line)* the extent to which *worry 1* is personally relevant:**

Not at all _____ **Totally**

2. **Please indicate *(with a line)* the extent to which *worry 1* is distressing:**

Not at all _____ **Totally**

Worry 2 …….
…….

1. **Please indicate *(with a line)* the extent to which *worry 2* is personally relevant:**

Not at all _____ **Totally**

2. **Please indicate *(with a line)* the extent to which *worry 2* is distressing:**

Not at all _____ **Totally**

Appendix 8

Manipulation Check Scales

(1) During those 2 minutes focused on your worry topic, how much of your mental activity was in images?

0 Not at all in images **100** In images all the time

……

(2) During those 2 minutes focused on your worry topic, how much of your mental activity was in words, sentences and questions?

0 Not at all in words, sentences and questions **100** In words, sentences and questions all the time

……

(3) What % of the time when you were thinking about your worry topic were your thoughts/images:-

- Negative _____
- Neutral _____
- Positive _____

= 100%

Appendix 9

Repetition of Analyses after Removing Extreme Outliers

The congruency effect (see Section 3.3.1) was re-analysed after excluding the extreme outliers and all main effects and interaction effects retained significance (Probe Position: $F(1, 46) = 88.283$, $p < .001$, $\eta^2 = .657$; Probe Position x Group: $F(1, 46)$, $p = .029$, $\eta^2 = .100$; Threat Position x Probe Position x Group: $F(1, 46)$, $p = .029$, $\eta^2 = .099$).

The two repeated measures ANOVAS conducted separately on the Verbal and Imagery group (see Section 3.3.1) were repeated after removing the two extreme outliers in the Imagery group. The same pattern was found: No Threat Position x Probe Position interaction in the Imagery group ($F(1, 22) = 1.120$, $p = .301$, $\eta^2 = .048$) but a main effect of Probe Position was found ($F(1, 22) = 117.984$, $p < .001$, $\eta^2 = .843$); a main effect of Probe Position for the Verbal group ($F(1, 24) = 18.841$, $p < .001$, $\eta^2 = .440$) as well as a significant Threat Position x Probe Position interaction ($F = 4.275$, $p = .050$, $\eta^2 = .151$).

A study to investigate differential responses to IAPT-provided therapy between different ethnic groups

Marc Williams

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Contents

Figures and Tables

1.1 Abstract

There is some indication in the literature that psychotherapeutic treatment outcomes vary according to service user ethnicity, although this is by no means a consistent finding. This has important implications for the fair treatment of service users from culturally diverse backgrounds. The aim of this study was to investigate service user treatment response by ethnicity in the Southwark IAPT (Improving Access to Psychological Therapies) service by comparing service users of different ethnic groups on their response to treatment as indicated by changes in depressive and anxious symptomatology. The results of this study do not indicate differential treatment response by ethnicity between three main ethnic groups: 1. White British; 2. Any Other White Background; 3. Black or Black British. This finding is discussed in terms of how well Southwark IAPT may be doing to enhance the acceptability and accessibility of its services to Black and Minority Ethnic (BME) groups but also in terms of methodological issues potentially obscuring a difference in treatment outcomes by ethnicity that might exist. Some means of improving the way in which service user ethnicity is monitored are discussed. A subsidiary representativeness analysis confirms previous findings in the literature of an underrepresentation of Black and Black British service users in primary care settings. The discussion explores ways in which Southwark IAPT could continue to improve its acceptability and accessibility to BME groups.

1.2 Background

In attempting to ensure a fair distribution of mental health services in society, categorising people becomes necessary. Race is one classification system, which is based on a putative genetic distinction between groups of different geographical origins; however, this term has become increasingly otiose within academia for a variety of reasons. For example, there has been widespread interbreeding of peoples of different geographical origins over the course of history (e.g., as Spickard [1992] illustrates in the case of modern America), an observation that calls into question any group distinction based on genetic inheritance.

Ethnicity might be a more meaningful term, which Weber (1922) defined as a belief in a common descent "because of similarities of physical type or of customs or both, or because of memories of colonization and migration". Weber also included in his definition that an "objective blood relationship" between people in the group was not necessary for their membership; therefore, this term includes the biological notion of race as well as that of cultural similarity, e.g., similar beliefs, languages and attitudes. Categorising people in this way allows us to hold in mind the differences that we observe between people while appreciating that the differences that are considered meaningful and the categories we apply based on these differences are subjective. The term ethnicity, however, also has many of the shortcomings of race, as noted by Kaplan and Bennett (2003), such as the fact that some individuals see themselves as affiliated with multiple groups. These authors have therefore laid out a set of suggested guidelines when using these terms in order to maximise their meaningfulness.

Why should there be an expectation of ethnic differences in response to psychological treatments? Robertson (2010) argues that the principles of cognitive-behavioural therapy (CBT), in which cognitions (thought content) are given primary importance in determining behavioural and affective responses to events, can be traced back to Socratic philosophy, Roman Stoicism in particular. One notable parallel that Robertson draws between CBT and ancient philosophy is the Socratic method of subjecting one's thoughts and interpretations to rational scrutiny. Furthermore, Epictetus, a Greek Stoic philosopher, is credited with the saying: "It's not what happens to you, but how you react to it that matters" – which could be said to mirror the nub of the cognitive-behavioural model of mental illness, i.e., that our interpretations of events determine our emotional reactions and not the events themselves. Albert Ellis, who created Rational Emotive Therapy (RET - a precursor to CBT), had also noted the Greek and Roman Stoic roots of RET and, additionally, how the principles of RET could be found in the statements of some of the ancient Taoist and Buddhist thinkers (Ellis, 1962). Therefore, cultural background could influence levels of exposure to the principles of CBT prior to therapy and, in turn, engagement/success in treatment.

Furthermore, mental health treatments for adults are overwhelmingly clinic-based and dyadic, informed by the notion that a mental illness is located within the individual. Watters (2001) discussed the mental health care of refugees from abroad and observed that many refugees presenting at mental health services might have a different "explanatory model" of their problems, such as seeing them in terms of external "social, political and economic" circumstances, as opposed to an "illness" located inside them. Both "explanatory models" of mental illness – the internal and the external – offer a valid perspective and could be seen simply as different levels of explanation. Nonetheless, until it

is shown that ethnic minorities are more likely to show a different explanatory model than British groups under a similar circumstance (such as that of refugee being a refugee), we cannot conclude that this is due to ethnicity as opposed to differences in circumstance.

Another pertinent cultural difference when considering differential treatment outcomes relates to the characteristic of being a collectivist or an individualistic culture (Hofstede, 1984). An individualistic society places high value on independence from others, in which one takes care of oneself and one's immediate family. A collectivist society consists of groups, such as extended families, in which members are loyal to one another and mutually dependent. Oyserman, Coon and Kemmelmeier (2002) provided evidence, for instance, that European Americans are, on average, of a relatively individualistic mindset ("valuing personal independence") and are less collectivistic ("feeling duty to in-groups") compared with this study's Chinese sample, which showed the opposite pattern. In view of this, some ethnic minorities may benefit more from therapeutic approaches with a philosophy that is more aligned to this collectivist perspective, such as family therapy or community psychology, which view the individual's mental illness as located at least partly within the system, such as the family or the wider community, in which they find themselves. It could be argued that CBT would best be categorised as a therapy tailored to an individualistic perspective, locating the disorder and the locus for change within the individual, which could make it a less appropriate treatment for those holding a more collectivist perspective.

There are factors more incidentally related to belonging to a minority ethnic group that could impinge on treatment success. One likely detractor from therapeutic benefit is degree of fluency in the therapist's language, which would be especially likely for those

people who emigrated more recently from their country of origin. Other factors related indirectly to ethnicity are level of education and socioeconomic status, which could interfere with treatment success in various ways, e.g., via increased financial stressors and lower levels of reading ability.

Now that we have considered theoretical reasons why there might exist differential treatment response between ethnicities, let us consider the evidence to date on this matter. The first study to suggest an interaction between ethnicity and psychotherapeutic outcome was conducted by Markowitz, Spielman, Sullivan and Fishman (2000), whose African-American service user sample showed a significantly poorer outcome in response to CBT than White and Hispanic service users. For the other treatments, i.e., interpersonal psychotherapy (IPT) and supportive psychotherapy with/without imipramine, no difference was found in outcomes with respect to ethnicity. Although the implications of such a differential response are myriad, there is a lack of well-conducted studies looking into this issue. Indeed, Markowitz et al. did not include any description for their interventions, and their sample sizes were small, with 14 White patients, eight Hispanic, and only four African-American patients receiving CBT. Furthermore, no mention was made either of the nature of the CBT delivered or any modifications that were made to treatment based on ethnicity.

Another study that hinted at differences in therapeutic outcome in relation to ethnicity is that of Chui, Safer, Bryson, Agras and Wilson (2007), who showed that, while there was no difference in rates of abstinence from bingeing and purging in eating disordered females of different ethnicities for the secondary outcome measure of reduction in binge eating, Black service users responded better to IPT than CBT compared with other

ethnic groups (White, Hispanic and Asian). This could be said to reflect Markowitz et al.'s results, showing African American samples to be less responsive to CBT but not less responsive to IPT, compared to the other ethnic groups represented in the study. However, again there is a problem with sample size, as only eight Black service users were included in total over the IPT and CBT groups. The authors argue that these results warrant further investigation, with adequate ethnic sample size and power, to look more closely at any benefits that IPT may confer in treating Black service users with bulimia nervosa.

There is also evidence for equivalent treatment outcomes across ethnic groups. Miranda et al. (2003) used a CBT intervention that was modified for female, low-income, minority service users with depression, but found no difference in response to therapy between White, Black and Latina women. Furthermore, Miranda et al. gave details of how they tailored their interventions, albeit purely language-based, i.e., the provision of bilingual clinical staff, which treated all Spanish-speaking women. Furthermore, all written materials were available in Spanish as well as English. All treatment staff, including nurses and psychotherapists, were experienced in working with low-income and minority service users. However, the authors mentioned no adaptations relating to Black service users' cultures. Similarly, Zoellner, Feeny, Fitzgibbons and Foa (1999) compared treatment outcomes between African American and Caucasian women with post-traumatic stress disorder (PTSD). They found no difference between these groups in response to CBT for PTSD. No details of cultural adaptations were mentioned by these authors.

The state of the evidence with regard to relative therapy outcomes between ethnic minorities is mixed and a consensus is nowhere near being reached. This could be partly due to how the research has been conducted. Voss Horrell and Sarah (2008) provided a

review of studies that have looked at therapy outcomes in various adult ethnic samples, noting that the vast majority of the studies in their review did not compare Black Minority and Ethnic (BME) groups with White groups but only compared BME group therapy outcomes with treatment-as-usual or with placebo, which does not fully address whether contemporary therapies are adequate for BME groups. The authors also noted that there has been inadequate reporting in the research of whether any adjustments have been made to therapy packages provided to BME groups and their review did not find any studies that drew a comparison between culturally-modified therapy and non-modified therapy in terms of therapeutic outcomes. Voss Horrell and Sarah recommended that studies should measure acculturation in their samples, i.e., the service user's "degree of identification with the majority culture".

Huey and Polo (2008) also raised the issue of acculturation in their review of research into evidence-based treatments for ethnic minority youth, in which they pointed out that there has traditionally been a poor representation of less acculturated populations in such studies. These authors argued that the more acculturated ethnic minority youth could be quite similar to the ethnic majority and that, by under-representing the less acculturated populations in outcomes research, this research will inevitably overestimate the efficacy of standard evidence-based treatments for ethnic minorities.

Accordingly, some researchers have looked into culturally-tailored therapy. Two correlational studies showed an association between ethnic match between client and therapist and positive therapeutic outcome (Halliday-Boykins, Schoenwald & Letourneau, 2005; Yeh, Eastman & Cheung, 1994). The former investigated multisystemic therapy (MST), whereas the latter did not report any particular therapeutic modality. However, as

correlational studies, neither proves a causal link between ethnic match and better outcome, as service users were not randomly assigned to matched therapists.

Research that has experimentally manipulated culturally-relevant variables has not yielded results that are unequivocally in favour of culturally-tailored therapy. Genshaft and Hirt (1979) conducted a study into ethnic matching and outcomes, in which African American and European American youth were randomly assigned to either a therapist of the same race, a therapist of the opposite race, or to a no-treatment control condition. On one subtest, training by White models led to better outcomes in cognitive impulsivity for youth of both ethnicities than training by either Black models or no treatment. However, on another subtest both White and Black children improved similarly and significantly, but there was an interaction effect in which this improvement was only evident when the therapist's race was matched with the child's race.

Szapocznik et al. (1986) compared Structural Family Therapy (SFT) with Bicultural Effectiveness Training (BET) as an intervention for Cuban American families with an adolescent family member demonstrating "conduct disorder and/or social maladjustment". BET and SFT differed only in that BET added the teaching of "bicultural skills" to families (e.g., methods for addressing intercultural conflict between the youth and parents). BET was not found to confer additional benefit over SFT. Therefore, much like research into differential psychotherapeutic outcomes by ethnicity, the state of the evidence into the benefits of culturally-tailored therapy remains equivocal.

1.3 Service Evaluation

The aim of the current study was to explore differences in therapeutic outcomes across different ethnic groups. The service that was investigated was the Southwark IAPT (Improving Access to Psychological Therapies) service, consisting of four locality clusters: North East (NW), North West (NW) South East (SE) and South West (SW). This service is otherwise called the Southwark Psychological Therapies Service (SPTS). For convenience, the term IAPT will be used throughout.

Southwark IAPT was an IAPT transition site from 2008 and, in October 2009, became an IAPT service. Therapy provided within IAPT follows the "Stepped Care" model that is the organising principle underlying many NICE recommendations. Gilbody and Bower (2011) describe two of the principles underlying "Stepped Care": "Least burden", in which the most effective but least economically burdensome treatment is offered to patients and "scheduled review", in which service users are transferred up to higher intensity or down to lower intensity treatments if needed. Therefore, IAPT consists of low- and high-intensity therapy. Low-intensity therapy comprises bibliotherapy and computerised CBT. IAPT also runs groups, which are facilitated by both low- and high-intensity clinicians: Mental health workshops (sleep/self-confidence/stress), group therapy (panic/anxiety/depression) and mindfulness-based cognitive therapy groups. High-intensity therapy comprises one-to-one therapy in the form of CBT, IPT or eye movement desensitisation and reprogramming (EMDR). Of these three therapies this study only considers CBT as the vast majority of service users will be seen for this therapy and, therefore, sample sizes for the other two are very low.

The relevant outcomes in this study are the Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer and Williams, 2001), which measures depressive symptomatology using a nine-question Likert Scale, and the Generalised Anxiety Disorder Questionnaire (GAD-7; Spitzer, Kroenke, Williams and Löwe, 2006), which measures anxious symptomatology using a seven-question Likert Scale. The PHQ-9 has been shown to be reliable and valid (Kroenke et al., 2001) and to have good sensitivity to change (e.g., Löwe, Kroenke, Herzog and Gräfe, 2004). The GAD-7 has also been shown to be reliable and valid (Spitzer et al., 2006).

The main hypothesis of this study was that the BME service users would show less favourable outcomes than White British service users with respect to comparisons in PHQ-9 (symptoms of depression) and GAD-7 (symptoms of anxiety) scores between first and final taking.

1.4 Method

1.4.1 Data Collection

Data was extracted from the IAPTus service user database (an online, password-protected system for entering and analyzing clinical data). Data for service users in the analyses had already been collected as a matter of routine procedure, in which each therapist administers a standard weekly IAPT measure that includes the PHQ-9 and the GAD-7. Ethnicity data is also collected routinely at each assessment.

1.4.2 Data Analysis

Under the “Analysis” tab of IAPTus service user database, the “Activity Analysis” report was generated first of all, including all ethnicities. Treatment type to be included in

the analysis was selected as “IAPT Treatment”. This analysis included only people who had entered “Step 2” (low-intensity therapy) at some point between 01.10.09 and 01.10.10 and who had never entered “S3 - CBT” (high intensity therapy) at any point during this time. The analysis included only service users who had ended treatment by the time of analysis (December, 2010) and this was defined by service users having entered any ending stage at any time, such as “Discharged” or “Ended Treatment”. Then service user IDs were exported from this report separately for each locality cluster in turn (NE, NW, SE, SW), which were then combined, giving the total sample of service users who had entered any low-intensity therapy stage at any point between 01.10.09 and 01.10.10 over all of IAPT, but who had never entered any high-intensity therapy, and whose treatment had come to an end by the time of analysis (December, 2010).

Step 2 included:

S2 cCBT (Computerised CBT)

S2 Group (Group therapy)

S2 Guided Self Help (Bibliotherapy)

The “Activity Analysis” report was generated again, including all ethnicities, selecting the treatment type to be included in the analysis as “IAPT Treatment”. However, this analysis included only people who had entered “S3 - CBT” (High-intensity CBT) at any point between 01.10.09 and 01.10.10, whether or not they had ever entered Step 2 (low intensity therapy) at any point. Again, the analysis included only service users who had ended treatment by the time of analysis (December, 2010).

Step 3 included:

S3 CBT (One-to-one, high-intensity CBT)

Then service user IDs were exported from this report, separately for each locality cluster in turn (NE, NW, SE, SW), which were then combined, giving the total sample of service users who had entered any high-intensity therapy stage at any point between 01.10.09 and 01.10.10, over all of Southwark Psychological Therapies Services, whether or not they had ever entered low-intensity therapy, but whose treatment had come to an end by the time of analysis (December, 2010).

Then the separate analyses were pooled together over the four separate locality clusters, ending up with all the service user IDs in the NE locality cluster, whether they received low-intensity therapy without high-intensity or high-intensity with or without low-intensity therapy. The same was repeated for the NW, SE, and SW locality clusters. Each analysis was looked through for any duplicate IDs, but there were found to be none. The entire resulting service user IDs over the NE, NW, SE and SW clusters were then combined into one "ID Spreadsheet".

Then an "IAPT -> Data Export – Care Pathway" analysis was generated, which included all ethnicities and all types of treatment between 01.10.09 and 01.10.10. The "Find" function was used within the resulting Excel file to search for IDs found in the "ID Spreadhseet" and to extract only those IDs and their corresponding beginning (pre-) and end (post-) PHQ-9 and GAD-7 scores. The beginning scores were those at each service user's assessment, prior to being put on the waiting list for treatment, whereas the end scores were from the final measures taken from each service user, whether at the end of a full course of therapy or at the end of an incomplete course of therapy. The sample thus

included dropouts and people who were not seen for a full course of therapy for other reasons, as well as treatment completers.

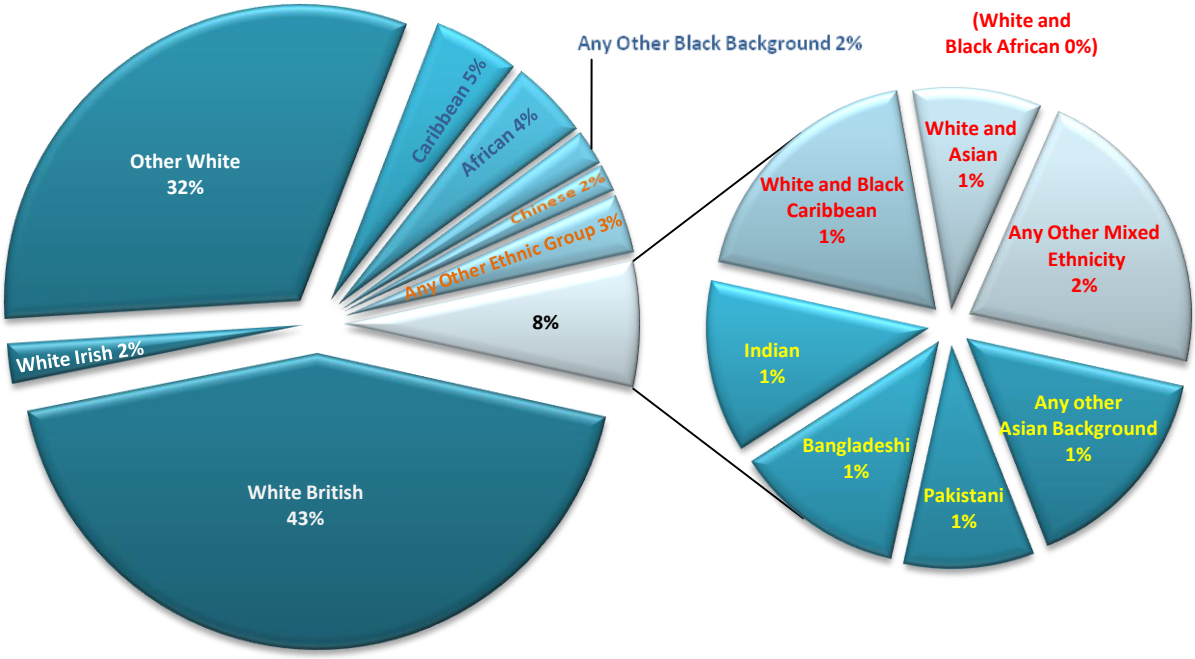
The “IAPT -> Data Export - Demographics” analysis was generated for all service users that had been seen by the service between 01.10.09 and 01.10.10 and the “Find” function was used within the resulting Excel file to search for relevant service user IDs found in the “ID Spreadsheet” and to extract only those IDs and their corresponding “ethnicity category” and gender into a separate Excel spreadsheet. Seven service users had opted not to disclose their ethnicity and 25 service users had not stated their ethnicity; their data were not included in the study.

Table 1 shows the breakdown of ethnicity and gender of all service users accepted for IAPT treatment between 01.10.09 and 01.10.10. The ethnic breakdown of service users can also be seen visually in Figure 1.

Table 1. Ethnicity and gender breakdown of service users accepted for Southwark IAPT treatment from 01.10.09 to 01.10.10.

Ethnic group	Ethnic subgroup	Number	Male	Female	Percentage
White	British	202	81	121	77.4194
	Irish	10	4	6	
	Any Other White Background	148	51	97	
Mixed Ethnicity	White and Black Caribbean	6	2	4	3.4408
	White and Black African	0	0	0	
	White and Asian	3	0	3	
	Any Other Mixed Ethnicity	7	3	4	
Asian or Asian British	Indian	5	1	4	3.4408
	Pakistani	3	1	2	
	Bangladeshi	4	0	4	
	Any other Asian Background	4	1	3	
Black or Black British	Caribbean	22	2	20	10.9677
	African	20	5	15	
	Any Other Black Background	9	5	4	
Other Ethnic Groups	Chinese	7	3	4	4.7312
	Any Other Ethnic Group	15	4	11	
Grand Total:		465	163	302	100

Figure 1. Pie chart of ethnicities of service users accepted by Southwark IAPT between 01.10.09 and 01.10.10.



Due to a lack of previous studies reporting effect sizes for differences in therapy outcomes between ethnic groups, a power analysis co uld not be calculated. A sample size of 30 was deemed a reasonable cut-off for inclusion in the analyses. Only three groups met this cut-off: White British (n = 202), Any Other White Background (n = 148) and Black or Black British (n = 51; this sample size was achieved by collapsing the categories of Caribbean, African and Any Other Black Background.)

A small proportion of those in therapy between 01.10.09 and 01.10.10 did not have the requisite post-PHQ-9 and GAD-7 scores in order to include them in the analysis and some did not have the pre-PHQ-9 and GAD-7 scores either. An "IAPT Data Export

Clinical Contacts" analysis showed that most of these service users had only attended one therapy session, and had therefore only completed the pre- PHQ-9 and GAD-7. Two had not attended their scheduled session and, for one service user, there was no record in the Data Export file of any session having been arranged. Therefore, these service users were excluded from the analysis. Fifteen people were excluded from the White British group on this basis, leaving a total of 187 White British service users in the final analysis (8.02% of White British service users were excluded due to data incompleteness); 2 people were excluded from the Any Other White Background group on this basis, leaving a total of 146 White service users in the final analysis (1.37% of Any Other White Background service users were excluded due to data incompleteness); 4 people were excluded from the Black or Black British group on this basis, leaving a total of 47 Black or Black British service users in the final analysis (7.84% of Black or Black British service users were excluded due to data incompleteness.); one person had not stated their ethnicity.

For these 22 excluded subjects, only 18 had a pre-PHQ-9 and pre-GAD-7 score, the means of which were calculated as 11.39 (SD = 8.16) and 10.06 (SD = 7.30), respectively. Although no formal analysis was conducted to compare these scores with those of the main sample due to 18 being a low sample size, the means for these 18 service users' scores do not appear significantly discrepant from those of the main sample (see Results section), indicating that their exclusion from the data would not have led to an overestimation of treatment success due to drop out bias.

1.5 Results

1.5.1 Descriptive Statistics

The final sample to be analysed consisted of the following groups: White British (*n* = 187), Any Other White Background (*n* = 146) and Black or Black British (*n* = 47). Table 2 shows the descriptive statistics of these groups' outcome measures as a whole.

Table 2. Mean and standard deviation of outcome measures at first and final taking.

	Mean	Standard Deviation
PHQ-9 first	12.7053	6.71724
PHQ-9 last	7.3158	6.32958
GAD-7 first	10.7395	5.77210
GAD-7 last	6.5132	5.66965

1.5.2 Main Analyses

Two one-way ANOVAs were performed on the data from these 3 groups, one to look at ethnicity group differences in change in PHQ-9 score and the other to look at ethnicity group differences in change in GAD-7 score. Skewness and kurtosis values for change in PHQ-9 and GAD-7 scores were all within the range of -2 to +2, which was accepted as near enough normally distributed for an ANOVA to be meaningful.

The ANOVAs indicated that the change in PHQ-9 scores and GAD-7 scores was not significantly different at the 5% level between the three ethnicity groups (PHQ-9: $F(2, 377) = 1.004$, $p = .367$; GAD-7: $F(2, 377) = .590$, $p = .555$)

In order to assess whether there had been a therapeutic change in service users' depression and anxiety as a result of intervention, regardless of ethnicity, two-tailed paired-samples *t*-tests were carried out to compare first and last PHQ-9 and GAD-7 scores. Skewness and kurtosis values of PHQ-9 first and last and GAD-7 first and last scores were all within the range of -2 to +2, which was accepted as near enough normally distributed for a *t*-test to be meaningful. Both *t*-tests indicated that scores changed significantly at the 5% level between the first and last taking (PHQ-9: $t(379) = 15.976$, $p < .001$; GAD-7: $t(379) = 13.548$, $p < .001$). Descriptive statistics of changes in questionnaire scores are shown in Table 3.

Table 3. Mean and standard deviation of changes in outcome measures between first and final taking.

Comparison	Mean	Standard Deviation
PHQ first – PHQ last	5.3895	6.5762
GAD first – GAD last	4.2263	6.0809

1.5.3 Subsidiary Analyses

1.5.3.1 Caseness.

The proportion of service users who presented at caseness at the beginning of therapy (PHQ ≥ 10 or GAD ≥ 8) across the different ethnic groups is shown in Table 4:

Table 4. Caseness on assessment across the three ethnic groups.

Ethnicity	Number reaching caseness on initial assessment	% reaching caseness on initial assessment
White British	134	71.66
Any Other White Background	113	77.40
Black or Black British	38	80.90

Given that a sizeable minority from each group did not present at caseness at the beginning, it was reasoned that this could obscure an effect of ethnicity on therapy outcomes, as those who were below caseness at the beginning may not have derived their maximal benefit from therapy. This was especially important as Table 4 indicates a possible discrepancy in percentage reaching caseness on assessment between the three groups.

In order to address this, a separate Excel spreadsheet was created which excluded data from service users who were below caseness, i.e., whose PHQ-9 score was nine or below *and* whose GAD-7 score was seven or below. Two one-way ANOVAs were performed to compare the change in PHQ-9 and GAD-7 scores between the three ethnicity groups. Skewness and kurtosis values for change in PHQ-9 and GAD-7 scores for only those service users reaching caseness on assessment were all within the range of -2 to +2, which was accepted as near enough normally distributed for an ANOVA to be meaningful.

The ANOVAs indicated that the change in PHQ-9 scores and GAD-7 scores was not significantly different at the 5% level between the three ethnicity groups (PHQ-9: $F(2, 284) = .649$, $p = .523$; GAD-7: $F(2, 284) = .205$, $p = .815$).

1.5.3.2 Representativeness.

The question of the representativeness of IAPT service users, although not the focus of this service evaluation, was nonetheless deemed important to consider. Research has shown, for example, that Black service users are over-represented in high secure settings, e.g., Kaye and Lingiah (2000), whereas their treatment at an earlier period in the development of their mental illness is limited partly by a lower likelihood of consulting GPs regarding mental health problems (e.g., Bhugra et al., 1997) as well as a reduced ability of GPs to recognise psychiatric disorder in Black patients (e.g., Commander, Dharan, Odell & Surtees, 1997). Brown, Schulberg and Madonia (1996) showed their African American sample with depression to have significantly more predominant somatic symptoms and also to report significantly higher physical disability than the White American sample, arguing that GPs' difficulties with detecting depression in the former might partly be based on culturally-specific ways in which depression manifests.

Appendix 1 shows the relative proportions of different ethnic minorities in Southwark primary care psychological therapy services (i.e., the precursor to Southwark IAPT) over four years (2004-2008; Data collated by Dr Jane Hutton). This can be compared with Table 1, which shows the proportions of services users from different ethnic groups accepted by Southwark primary care psychological therapy services (which had become Southwark IAPT) between 01.10.09 and 01.10.10. Visual comparison of Appendix 1 and Table 1 does not indicate any obvious differences in the proportions of different ethnicities represented in primary care before and after Southwark primary care psychological therapy services became IAPT.

Due to the broader categories in Appendix 1 (collapsing White British, White Irish and Any Other White Background under the category "White", for example), only one analysis was carried out to explore the broad change in the proportion of White and non-White service users accepted by Southwark primary care psychological therapy services since 2008. A non-parametric binomial test indicated that the percentage of White service users (including British, Irish and Any Other White Background) seen for therapy in the period sampled by this study (77.4%) had not changed significantly at the 5% probability level since 2008 (74.2%), although this was approaching significance (p = 0.61), and therefore that the percentage of non-White service users considered as a whole had not changed (25.8% in 2008 compared with 22.6% in the current study).

According to the 2001 Census, 52.3% of people in the London Borough of Southwark identified their ethnicity as White British (source: Office of National Statistics (ONS) estimated resident population by ethnic group). This ethnic breakdown is displayed in Figure 2. Appendix 2 shows a table of numbers and proportions of ethnic groups in Southwark according to the 2001 Census. It should be noted that the population of Southwark has changed considerably since 2001, i.e., with a reduction in the number of Black people and an increase in White non-British people (ONS estimated resident population by ethnic group). The ONS provides estimates of "experimental" estimates of the current ethnic proportions in Southwark, based on extrapolation of figures since the 2001 Census.

Various non-parametric binomial tests were conducted to compare the proportions of different ethnicities accepted by IAPT over the period sampled in this study with those in the population of Southwark in 2001, according to the Census.

1. The percentage of White British people accepted by Southwark IAPT over the period sampled in this study (43.44%) was significantly lower at the 5% probability level than the percentage of people from a White British background in the Southwark population in 2001 ($p < 0.01$).

2. The percentage of people of Any Other White Background accepted by Southwark IAPT over the period sampled in this study (31.83%) was significantly higher at the 5% probability level than the percentage of people from Any Other White Background in the Southwark population in 2001 ($p < 0.01$).

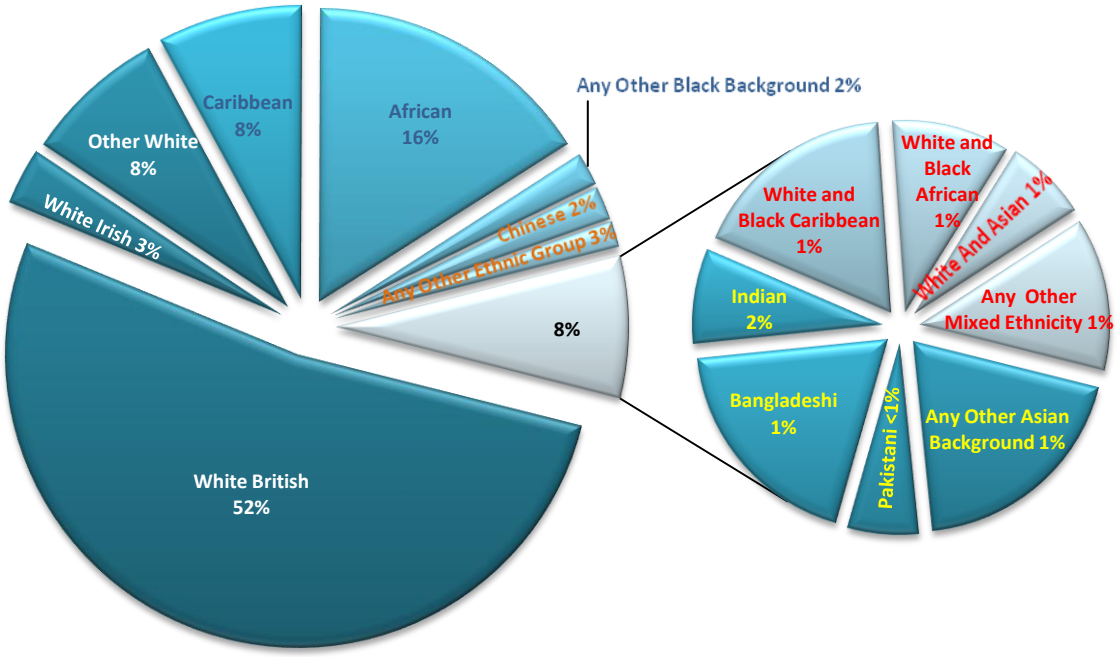
3. The percentage of people from a White Irish background accepted by IAPT over the period sampled in this study (2.15%) was not significantly different at the 5% probability level than the percentage of people from a White Irish background in the Southwark population in 2001 ($p = .146$).

4. The percentage of people of Mixed Ethnicity (White and Black Caribbean; White and Black African; White and Asian; Any other Mixed Ethnicity) accepted by Southwark IAPT over the period sampled in this study (3.44%) was not significantly different at the 5% probability level than the percentage of people of Mixed Ethnicity in the Southwark population in 2001 ($p = .446$).

5. The percentage of people of Mixed Ethnicity (White and Black Caribbean; White and Black African; White and Asian; Any other Mixed Ethnicity) accepted by Southwark IAPT over the period sampled in this study (3.44%) was not significantly different at the 5% probability level than the percentage of people of Mixed Ethnicity in the Southwark population in 2001 ($p = .446$).

6. The percentage of Black people (Carribean; African; Any Other Black Background) accepted by Southwark IAPT over the period sampled in this study (10.97%) was significantly lower at the 5% probability level than the percentage of Black people in the Southwark population in 2001 ($p < .01$).

Figure 2. Pie chart representing the population of Southwark by Ethnic Group in 2001.



1.6 Discussion

The principal finding from this study was that of no significant difference in therapy outcomes between service users who are Black and Black British, White British and of Any Other White Background, with respect to changes in depressive and anxious symptomatology in response to IAPT treatment. This non-significance held even when those service users who were not at caseness on assessment were excluded from the

analysis. Therefore, the main hypothesis of the study, of less favourable outcomes in BME service users than in White British service users, is not supported.

Perhaps the most immediately apparent explanation for this is that, in Southwark IAPT**,** therapy is equally efficacious for use with Black and Black British as well as Any Other White BME groups as it is for use with White British groups. What might Southwark IAPT be doing right in its provision of therapy to these BME groups?

IAPT has made efforts to improve the acceptability of therapy to BME groups. First of all, training on working with cultural/ethnic diversity is covered as part of IAPT courses, which might better equip IAPT high- and low-intensity trainees to adapt their approach to individual clients' needs. Furthermore, the provision of group workshops for patients forms a large part of low-intensity therapy, which may be perceived as less hierarchical than the one-to-one therapeutic dyad, potentially improving acceptability to BME groups. A group setup might furthermore allow for a better treatment of certain issues of which many IAPT therapists, who are predominantly White British, could have little theoretical or experiential understanding, such as the societal and institutional prejudice that can be experienced by BME groups. These workshops are often held in areas of high BME rates (such as Peckham Pulse, a Gym in the middle of Peckham) again adding to their perceived acceptability to BME groups.

When constructing its Information Leaflet for service users, Southwark IAPT liaised with Cares of Life (a Maudsley-funded organisation, which aims to improve accessibility to BME groups, especially the Black population), who had a lot of input into the design of the Leaflet and helped with making it more welcoming to BME groups. Moreover, Southwark IAPT publicises in pubs, libraries, GP surgeries, churches and

community centres. Some of these advertising locales may be particularly good for improving access to BME groups, as they are separate from the medical context and enter, for example, a spiritual/religious context. This is particularly important for improving access to those for whom mental illness is more meaningfully conceptualised as a spiritual/religious crisis.

Although the principal finding of this research is encouraging, it should be interpreted with caution, as there are some notable limitations to this study. Firstly, White British service users were not all placed in the same ethnic category. This is because, under the heading of "Other White Background" are included six subcategories that are within Britain (English, Scottish, Welsh, Cornish, Northern Irish and Ulster Scots), in addition to various ethnicities outside Britain (such as Greek Cypriot, Polish and Croatian). Therefore, an English person could have self-categorised as either White British within the White category or as English within the Any Other White Background category. It is likely that this overlap of ethnic categories contaminated the comparison of White British and Any Other White Background in this study.

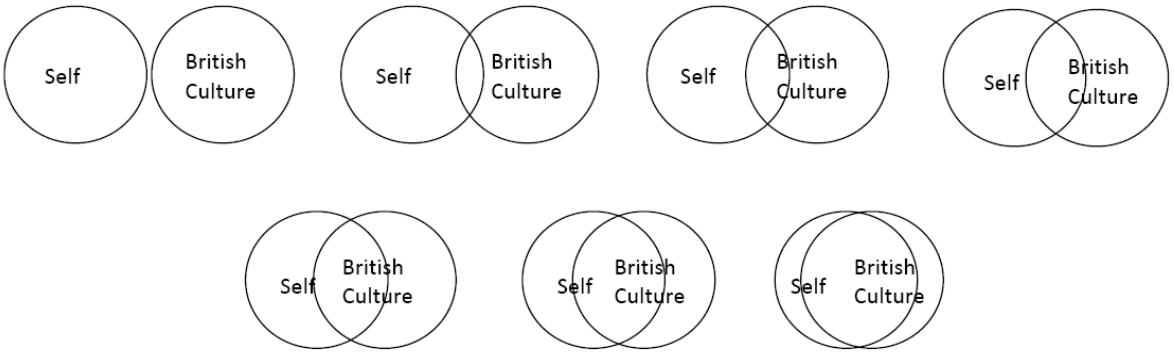
A second limitation is that very few of the people seen in IAPT are likely to be low-acculturated: they may tick a box describing themselves as African, for instance, but have a very fluent level of English and a typically Westernised perspective of mental illness and of the effectiveness and appropriateness of IAPT-delivered psychological interventions. This is a problem common to previous research. As discussed previously, research into treatment outcomes has traditionally under-represented less acculturated ethnic minorities, and has likely overestimated the efficacy of Western treatments for ethnic minorities. With no

indication of degree of acculturation, this study might have been blind to any differences in treatment effectiveness across ethnicities.

The main reason that the data are blind to levels of acculturation is that service users' ethnic self-categorisation will inevitably be subjective and open to bias from a range of sources, such as fear of prejudice and desire for (non)conformity with the prevailing culture. IAPT might need to start collecting data on more meaningful markers of ethnicity that indicate degree of acculturation and are not as open to such biases. This will allow future clinicians/researchers to draw the most meaningful group comparisons, addressing the hypothesis of the current study to a more satisfactory level.

One approximation of degree of acculturation might be the number of years someone has spent in the host country, increasing their chances of taking on its values, cultural beliefs and cultural practices. Although IAPT already collects data on preferred language, asking people about the language spoken at home could fine-tune the measurement of degree of acculturation. Finally, a more subjective measure of acculturation could be useful, such as an adaptation of "The Inclusion of Other in the Self (IOS) Scale" (Aron, Aron & Smollan, 1992). Service users could be asked to select one pair of overlapping circles from an array that best describes their degree of identification with British Culture (see Figure 3).

Figure 3. A means of categorising one's degree of acculturation with British culture, adapted from the Inclusion of Others in the Self (IOS) Scale (Aron et al., 1992).



This study demonstrates an underrepresentation of Black and Black British groups in Southwark IAPT. This underrepresentation will undoubtedly be far worse for the least acculturated BME groups, for whom it could be argued CBT in its non-adapted form is least likely to be effective, for the reasons outlined in the introduction. Therefore, there is a need to increase the representation of Black and Black British service users in Southwark IAPT. Future service studies of ethnic differences in treatment outcomes should go hand in hand with increased drives to recruit ethnic minorities into psychological therapy.

Webster (2002), in this document entitled "Improving Psychology Services to Diverse Communities" (on the South London & Maudsley NHS Trust Intranet), gives a detailed list of possible avenues to explore when trying to improve accessibility and acceptability of psychology services to BME groups. One idea that Webster mentions, which could be applicable to Southwark IAPT, is to set up culturally specific therapy groups. This might be particularly helpful for those who are experiencing a difficult transition to British life and culture and, and in order to provide a forum in which to share common culture-bound experiences or, as mentioned previously, in which to discuss with others in a similar situation the prejudice that can be directed toward BME groups.

Webster (2002) argues that involving BME organisations, such as faith leaders and those in the voluntary sector, is a key strategy in improving acceptability and accessibility of psychological therapies for BME groups. However, he makes the caveat that such organisations can feel "overconsulted", in which their views are often sought but rarely translate into changes to services. Committing to acting on views is important, therefore, and it is recommended in Webster's document that consultees should at least be asked to look over the write-up of consultation meetings before this is disseminated, in order to ensure that their views are accurately represented. Another important suggestion in this document is that of allocating therapy supervision time to a discussion of any ethnic differences between service user and therapist. This would likely require further training for IAPT supervisors.

Although it can be very helpful to enter into discussions with the service user about their ethnic backgrounds in order to develop rapport and to build a formulation of their difficulties, it could be that a deeper understanding of a service user's culture would be arrived at from another of Webster's suggestions, i.e., visiting service users at home. This would allow for a more direct experience of the service user's cultural context and how this may inform psychological formulation and intervention.

The current study indicated an underrepresentation of White British service users and an overrepresentation of service users of Any Other White Background, relative to the population of Southwark in 2001; however, this is likely to be an artefact of how ethnicity data is collected in IAPT, as the overlap in ethnic category discussed previously could have resulted in people of very similar ethnicities being placed in different ethnic groups. It is also possible that there has been, for some reason, an increase in the number of service

users of non-British White backgrounds seen by IAPT. The fact that the IAPTus analysis does not provide a breakdown of ethnic subgroups means that this could not be further explored in the current study.

In terms of other limitations to this study, in order to ensure sufficient sample sizes, some ethnic groups were collapsed to produce a larger group. Although a longer time period could be sampled in order to increase the sample size of each ethnic group, this could obscure the effects of more recent service changes. Finally, had time permitted, differential drop-out rates of different ethnic groups would have been an interesting analysis. There were found to be technical problems with this process.

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Appendix 1

Proportions of Different Ethnic Minorities in Southwark Primary Care Psychological Therapy Services over Four Years

Primary Care	2005 *N* [%]	2006 *N* [%]	2007 *N* [%]	2008 *N* [%]
White	200 [71.4]	370 [70.6]	240 [80.5]	439 [74.2]
Black African	23 [8.2]	15 [2.9]	4 [1.3]	25 [4.2]
Black Caribbean	17 [6.1]	46 [8.8]	16 [5.4]	21 [3.5]
Black Other	15 [5.4]	40 [7.6]	15 [5.0]	38 [6.4]
Indian	2 [0.7]	5 [1.0]	7 [2.3]	5 [0.8]
Pakistani	1 [0.4]	8 [1.5]	1 [0.3]	3 [0.5]
Bangladeshi	1 [0.4]	2 [0.4]	4 [1.3]	9 [1.5]
Chinese	4 [1.4]	5 [1.0]	1 [0.3]	14 [2.4]
Other Asian	3 [1.1]	0 [0]	4 [1.3]	3 [0.5]
Other	14 [5.0]	33 [6.3]	7 [2.3]	35 [5.9]
Total	280	524	298	592

Note: Data collated by Dr Jane Hutton.

Appendix 2

Population of Southwark by Ethnic Group According to the 2001 Census.

Ethnic Group	*N*	%
White British	134,200	52.3
White Irish	8,000	3.1
Other White	20,100	7.8
White and Black Caribbean	3,500	1.4
White and Black African	2,000	0.8
White and Asian	1,400	0.5
Other Mixed	2,600	1.0
Indian	3,900	1.5
Pakistani	1,200	0.5
Bangladeshi	3,800	1.5
Other Asian	1,600	0.6
Black Caribbean	20,300	7.9
Black African	40,800	15.9
Other Black	4,700	1.8
Chinese	4,800	1.9
Other Ethnic Group	3,700	1.4
Southwark	256,700	100.0